THE ROLE OF LOW LYING PUBIC TUBERCLE IN THE DEVELOPMENT OF INGUINAL HERNIA – A CASE CONTROL STUDY

DISSERTATON SUBMITTED FOR M.S DEGREE EXAMINATON

BRANCH I

(GENERAL SURGERY)

K.A.P.V GOVERNMENT MEDICAL COLLEGE AND MAHATMA GANDHI MEMORIAL HOSPITAL, TIRUCHIRAPALLI

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL 2017

DECLARATON BY CANDIDATE

I hereby declare that this dissertation entitled **"THE ROLE OF LOW LYING PUBIC TUBERCLE IN THE DEVELOPMENT OF INGUINAL HERNIA –A CASE CONTROL STUDY"** is the bonafide and genuine research work carried out by me under the guidance of **Dr. P. RAJAGOPAL M.S.,** Associate Professor, Department of General Surgery, KAPV Government Medical College and Mahatma Gandhi Memorial Hospital, Tiruchirapalli.

Date: Signature of the candidate

Place: **Dr. S. S. ABHINAND**

KAPV GOVERNMENT MEDICAL COLLEGE AND MAHATMA GANDHI HOSPITAL

CERTIFICATE BY GUIDE

This to certify that this dissertation entitled "**THE ROLE OF LOW LYING PUBIC TUBERCLE IN THE DEVELOPMENT OF INGUINAL HERNIA –A CASE CONTROL STUDY"** is a bonafide work of research done by **Dr.S.S.ABHINAND** in partial fulfillment of requirement for the degree of MS in GENERAL SURGERY.

Date **Signature of the Guide**

Place:

ENDORSEMENT BY HEAD OF THE DEPARTMENT AND HEAD OF THE INSTITUTION

This is to certify that this dissertation entitled **"THE ROLE OF LOW LYING PUBIC TUBERCLE IN THE DEVELOPMENT OF INGUINAL HERNIA –A CASE CONTROL STUDY"** is the bonafide research work done by **Dr. S.S.ABHINAND** under the guidance of **Dr. P. RAJAGOPAL M.S**., General Surgery, Associate Professor, Department of General Surgery, KAPV Government Medical College and Mahatma Gandhi Memorial Hospital, Tiruchirapalli.

Prof. Dr.S.LILY MARY M.D.,
Dean,
K.A.P.V. Govt. Medical College,
Trichy.

Dr. A.THULASI M.S., D.G.O.,
Professor and Head of Department,
Department of Surgery
K.A.P.V. Govt. Medical College,
Trichy

Place: Trichy
Date:

COPYRIGHT DECLARATION

I hereby declare that the KAPV Medical College and Mahatma Gandhi Memorial Government Hospital, Tiruchirapalli, shall have the rights to preserve, use and disseminate this dissertation in print or electronic format for academic/research purpose.

Date:

Place:

Dr.S.S.ABHINAND M.B.B.S.,
Post Graduate in MS General Surgery,
KAPV Government Medical College,
Tiruchirapalli

ACKNOWLEDGEMENT

Success and final outcome of this study required a lot of guidance and assistance from many people and I am grateful to have got all this assistance all along till the completion of my study.

I express my gratitude to **Dr. S. LILLY MARY M.D.,** Dean, KAPV Government Medical College and Mahatma Gandhi Memorial Hospital, Tiruchirapalli, for her invaluable support in conducting this study.

I acknowledge my sincere thanks to **Dr.A.THULASI M.S., D.G.O.,** Professor and Head of Department of General Surgery for his valuable advice and encouraging the study.

I wish to express my heartfelt respect and gratitude to my guide and unit chief, **Dr.P.RAJAGOPAL, M.S.,** Associate Professor, Department of General Surgery for his constant advise, invaluable suggestions and words of encouragement

I am extremely thankful to my unit Assistant Professors **Dr. S..SENTHILVEL M.S., Dr.V.SUJATHA M.S.,** and **Dr. V. VIMAL M.S.,** for their valuable guidance throughout my postgraduate study.

I also wish to thank **Dr. R.MOHAN, M,S., M.Ch.,** Chairman of the Ethical Committee of KAPV Medical College and Mahatma Gandhi Memorial Hospital, for granting me permission to conduct this study.

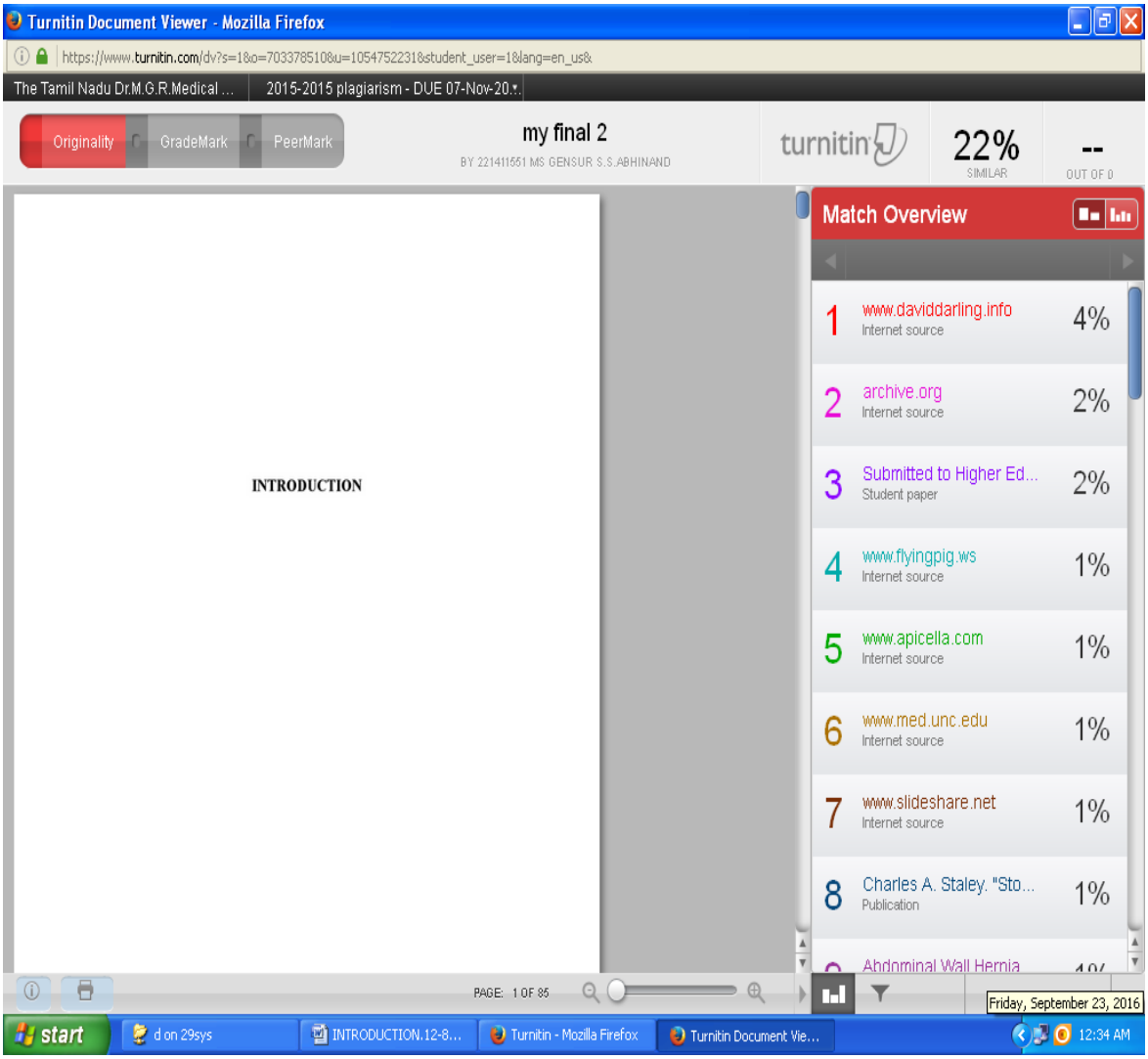
Last, but not the least, I am extremely thankful to my patients who willingly cooperated for this study.

K.A.P.VISWANATHAM GOVT. MEDICAL COLLEGE
TIRUCHIRAPALLI - 1
INSTITUTIONAL ETHICS COMMITTEE

CERTIFICATE OF CLEARANCE

This is to certify that the project work titled **The Role of low lying pubic tubercle in the development of inguinal hernia** proposed by **Dr. S.S. Abhinand** part of fulfilment of M.D/M.S course in the subject of **Surgery** for the year **2014-2017** by the Tamilnadu Dr. MGR Medical University has been cleared by the ethics committee.

CHAIRMAN,
Institutional Ethics Committee
K.A.P. Viswanatham Govt. Medical
College, Tiruchirapalli - 1


Turnitin Document Viewer - Mozilla Firefox
https://www.turnitin.com/dv?s=1&o=703378510&u=1054752231&student_user=1&lang=en_us&
The Tamil Nadu Dr.M.G.R.Medical ...
2015-2015 plagiarism - DUE 07-Nov-20...
Originality
GradeMark
PeerMark
my final 2
BY 221411651 MS GENSUR S.S.ABHINAND
turnitin
22%
SIMILAR
--
OUT OF 0
INTRODUCTION
PAGE: 1 OF 85
Match Overview
1 www.daviddarling.info Internet source 4%
2 archive.org Internet source 2%
3 Submitted to Higher Ed... Student paper 2%
4 www.flyingpig.ws Internet source 1%
5 www.apicella.com Internet source 1%
6 www.med.unc.edu Internet source 1%
7 www.slideshare.net Internet source 1%
8 Charles A. Staley. "Sto... Publication 1%
Abdominal Wall Hernia
Friday, September 23, 2016
start
d on 29sys
INTRODUCTION.12-8...
Turnitin - Mozilla Firefox
Turnitin Document Vie...
12:34 AM

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	221411551 Ms Gensur S.S.ABHINA...
Assignment title:	2015-2015 plagiarism
Submission title:	my final 2
File name:	my_mobi.docx
File size:	720.08K
Page count:	85
Word count:	13,104
Character count:	70,094
Submission date:	15-Sep-2016 06:27PM
Submission ID:	703378510

INTRODUCTION

TABLE OF CONTENTS

S.NO	PARTICULARS	PAGE NO.
1	INTRODUCTION	1
2	AIM AND OBJECTIVE	4
3	REVIEW OF LITERATURE	6
4	STUDY DESIGN AND METHODOLOGY	61
5	OBSERVATIONS AND RESULTS	65
6	DISCUSSION	85
7	SUMMARY	89
8	CONCLUSION	93
	BIBLIOGRAPHY	94
	ANNEXURES i. Proforma ii. Consent Form iii. Ethics Committee Clearance iv. Plagiarism Receipt v. Master Chart vi. Master Chart Keyword	

LIST OF ABBREVIATIONS

- EHS- European Hernia Society.
- USG- Ultrasonogram.
- CT- Computerised Tomogram.
- GPRVS- Giant Prosthetic Reinforcement of Visceral sac.
- TAPP- Transabdominal Preperitonial.
- TEP- Totally Extra-peritoneal.
- BMI- Body Mass Index.
- SS Line- Distance between two anterior superior iliac spine
- ST Line- Distance between pubic tubercle to SS line
- MP Line- Distance between midinguinal point to pubic tubercle

INTRODUCTION

DEFINITION

Hernia is the abnormal protrusion of a part or whole of the viscus through a normal or abnormal opening in the cavity that contains it.[1]The inguinal hernia based on anatomical characteristic divided into two types. The most common type is indirect inguinal henia, in which hernia sac emerge lateral to inferior epigastric artery.[2] It occur due to the persistence of processus vaginalis. Direct inguinal hernia occur medial to the inferior epigastric vessels when abdominal contents protrudes along a weak spot in the fascia transversalis which forms the posterior wall of the inguinal canal. Inguinal canal is 3.75cm in length [3]extends from deep to superficial inguinal ring. There are various defensive mechanisms of the inguinal canal to prevent the formation of hernia which are based on anatomical factors.

Anatomic variations of different structures facilitating herniation have been assessed. The origin of the internal oblique muscle from the inguinal ligament far away from the pubic tubercle and its lower fibers not covering the internal ring has been implicated in the indirect inguinal hernia[4].The various degree of incompleteness of the internal oblique muscle in the inguinal region lead to the essential predisposition to direct inguinal hernia .Other factors are an increase in the size of Hessert's triangle[5]. One important factor that determines the probability of an

individual to suffer from an inguinal hernia is the location of the pubic tubercle.[6]

Even though inguinal hernia is the most common type of hernia, the other types are femoral hernia, diaphragmatic hernia, hiatus hernia, umbilical, epigastric hernia, para umbilical hernia and incisional hernia. The rare varieties are spigelian hernia, parastomal, traumatic and lumbar hernia.

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

1. The aim is to find out the relationship of pubospinal distance between cases and control
2. 2.To study the clinical profile of inguinal hernia
3. To study the prevalence of hernia in various age group
4. To study the frequency of complication among the patients

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Hernia is one of the commonest surgical problem for which a general surgeon is called for. Hernia usually occur following disruption of the fibro muscular wall. The most common site is inguinal region in both sexes. The content can be anything which passes through the defect.

The word "hernia" is derived from a Latin term meaning "a rupture[7]." The earliest reports of abdominal wall hernias date back to 1500 BC. During this early period, abdominal wall hernia were treated with trusses or bandage dressings. The first report of operative repair of a groin hernia dates back to the first century AD.

The groin hernia classification based on the anatomy of the defect (i.e., inguinal versus femoral) dates back to the 14th century. The hernia is classified into direct and indirect based on anatomy first reported way back on 1559.

Incidence

Hernia is a common surgical problem among general population. It is estimated that 1 among 5 males and 1 among 20 females will suffer from this disease in their life time. But exact prevalence is debatable. Among this 3 out of 4 patient suffer from inguinal hernia. Among the inguinal hernia patient 2 out of 3 patient will suffer from indirect inguinal hernia.

The femoral hernia even though quite rare as compared to inguinal hernia, it is seen more common in women. This is true in umbilical hernia also. The male to female ratio is 25:1 for femoral hernia and 2:1 for umbilical hernia. Indirect inguinal hernia is most common type of hernia irrespective of age and sex. One among two patients suffering from femoral hernia will develop inguinal hernia in long term follow up. Both indirect inguinal and femoral hernias occur more commonly on the right side[11]. This is attributed to a delay in atrophy of the processus vaginalis after the normal slower descent of the right testis to the scrotum during foetal development. The predominance of right-sided femoral hernias is thought to be due to the compressing effect of the sigmoid colon on the left femoral canal.

The prevalence of inguinal hernia has two peaks, first peak is seen in infants and second peak after the middle age. The complication like irreducibility, strangulation, need for hospitalisation and mortality increases with age. Strangulation is the most dreaded complication of hernia. The risk of strangulation is related to neck of the sac. The femoral hernia with narrow neck is prone for strangulation. In inguinal hernia the indirect hernia is more prone for strangulation compared to direct hernia. Since the risk of strangulation is high all femoral hernia should be operated as early as possible when it is diagnosed.

ANATOMY OF GROIN REGION AND ABDOMINAL WALL

Anatomy of anterior abdominal wall and groin is essential for surgical repair and understanding the pathology of hernia.

Structure of the Anterior Abdominal Wall

The anterior abdominal wall is made up of skin, superficial fascia, deep fascia, muscles, extraperitoneal fascia, and parietal peritoneum.

Skin

The skin is loosely attached to the underlying structures except at the umbilicus, where it is adherent to the scar tissue.

Nerve Supply

The cutaneous nerve supply to the anterior abdominal wall is derived from the anterior rami of the lower six thoracic and the 1st lumbar nerves. The thoracic nerves are the lower five intercostal and the subcostal nerves. The 1st lumbar nerve is represented by the iliohypogastric and the ilioinguinal nerves.

Blood Supply

Arteries

The skin near the midline is supplied by branches of the superior and inferior epigastric arteries. The skin of the flanks is supplied by branches of the intercostal, lumbar, and deep circumflex iliac arteries . In addition, the skin in the inguinal region is supplied by the superficial

epigastric, the superficial circumflex iliac, and the superficial external pudendal arteries, branch of femoral artery.

Veins

The venous drainage above umbilicus mainly drains into the axillary vein via the lateral thoracic vein and below umbilicus into the femoral vein via the superficial epigastric and the great saphenous veins.

Superficial Fascia

The superficial fascia is divided into a superficial fatty layer (fascia of Camper) and a deep membranous layer(Scarpa's fascia)

Deep Fascia

The deep fascia in the anterior abdominal wall is merely a thin layer of connective tissue covering the muscles; it lies immediately deep to the membranous layer of superficial fascia.

Muscles of the Anterior Abdominal Wall

The muscles of the anterior abdominal wall consist of three broad thin sheets with aponeuroses in front; from exterior to interior they are the external oblique, internal oblique, and transverses abdominis . From either side of the midline anteriorly is, in addition, a vertical muscle named the rectus abdominis. As the aponeuroses of the three sheets pass forward, they enclose the rectus abdominis to form the rectus sheath[12].

The lower part of the rectus sheath may contain a small muscle called the pyramidalis.

External Oblique[13]

The external oblique muscle is a broad, thin, muscular sheet that arises from the outer surfaces of the lower eight ribs and fans out to be inserted into the xiphoid process, the linea alba, the pubic crest, the pubic tubercle, and the anterior half of the iliac crest . Most of the fibers are inserted by means of aponeurosis.

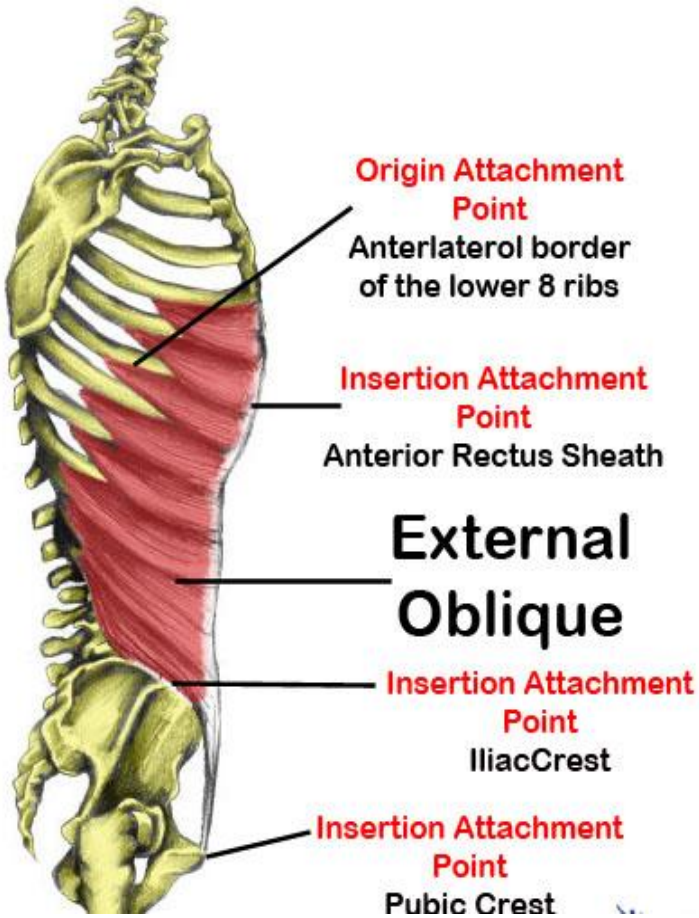


Fig 1. Anatomy of External Oblique

A triangular-shaped defect lies in the external oblique aponeurosis lies above and medial to the pubic tubercle. This is known as the **superficial inguinal ring**[14]. The spermatic cord (or round ligament of the uterus) passes through this opening and carries the **external spermatic fascia** (or the external covering of the round ligament of the uterus) from the margins of the ring.

Between the anterior superior iliac spine and the pubic tubercle, the lower border of the aponeurosis is folded backward on itself, forming the **inguinal ligament**. From the medial end of the ligament, the **lacunar ligament** extends backward and upward to the pectineal line on the superior ramus of the pubis. Its sharp, free crescentic edge forms the medial margin of the **femoral ring**. On reaching the pectineal line, the lacunar ligament becomes continuous with a thickening of the periosteum called the **pectineal ligament**[15].

The lateral part of the posterior edge of the inguinal ligament gives origin to part of the internal oblique and transverses abdominis muscles. To the inferior rounded border of the inguinal ligament is attached the deep fascia of the thigh, the **fascia lata** .

Internal Oblique[16]

The internal oblique muscle is also a broad, thin, muscular sheet that lies deep to the external oblique; most of its fibers run at right angles to those of the external oblique. It arises from the lumbar fascia, the anterior two thirds of the iliac crest, and the lateral two thirds of the inguinal ligament. The muscle runs upward and forward. The muscle is inserted into the lower borders of the lower three ribs and their costal cartilages, the xiphoid process, the linea alba, and the symphysis pubis.

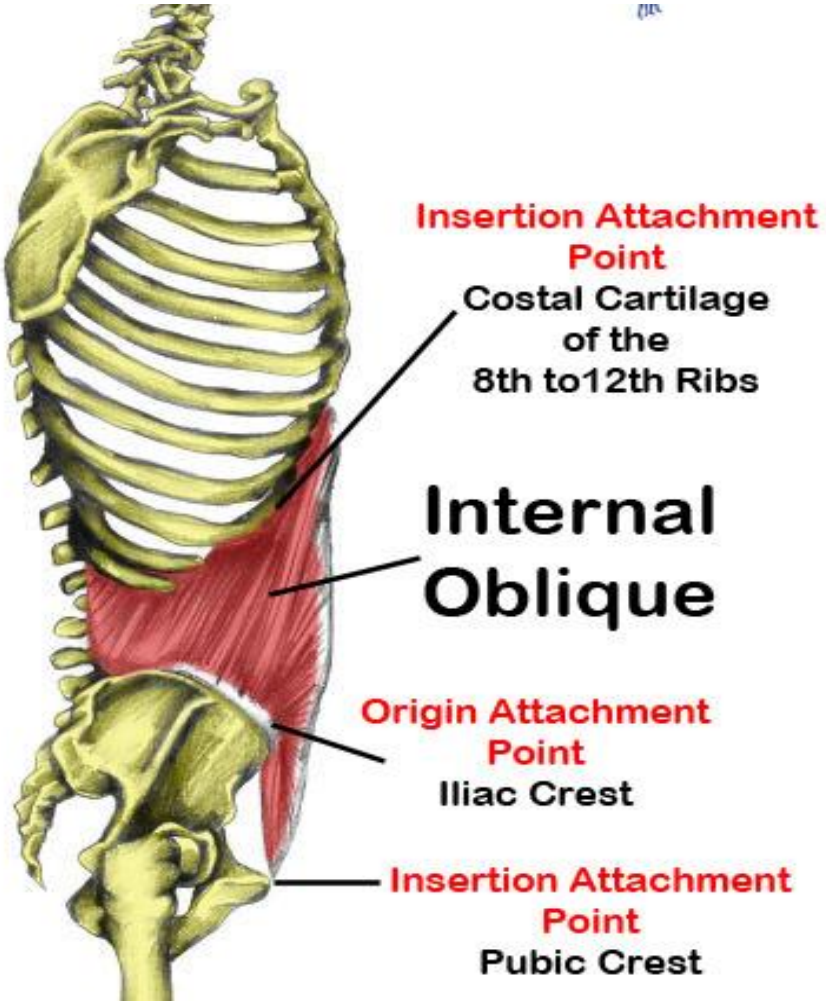


Fig 2. Anatomy of Internal Oblique

The internal oblique has a lower free border that arches over the spermatic cord (or round ligament of the uterus) and then descends behind it to be attached to the pubic crest and the pectineal line. Near their insertion, the lowest tendinous fibers are joined by similar fibers from the transversus abdominis to form the conjoint tendon. The **conjoint tendon** is attached medially to the linea alba, but it has a lateral free border.

As the spermatic cord (or round ligament of the uterus) passes under the lower border of the internal oblique, it carries with it some of the muscle fibers that are called the **cremaster muscle[17].** The **cremasteric fascia** is the term used to describe the cremaster muscle and its fascia.

Transversus abdominis

The transverses abdominis muscle is a thin sheet of muscle that lies deep to the internal oblique, and its fibers run horizontally forward. It arises from the deep surface of the lower six costal cartilages , the lumbar fascia, the anterior two thirds of the iliac crest, and the lateral third of the inguinal ligament

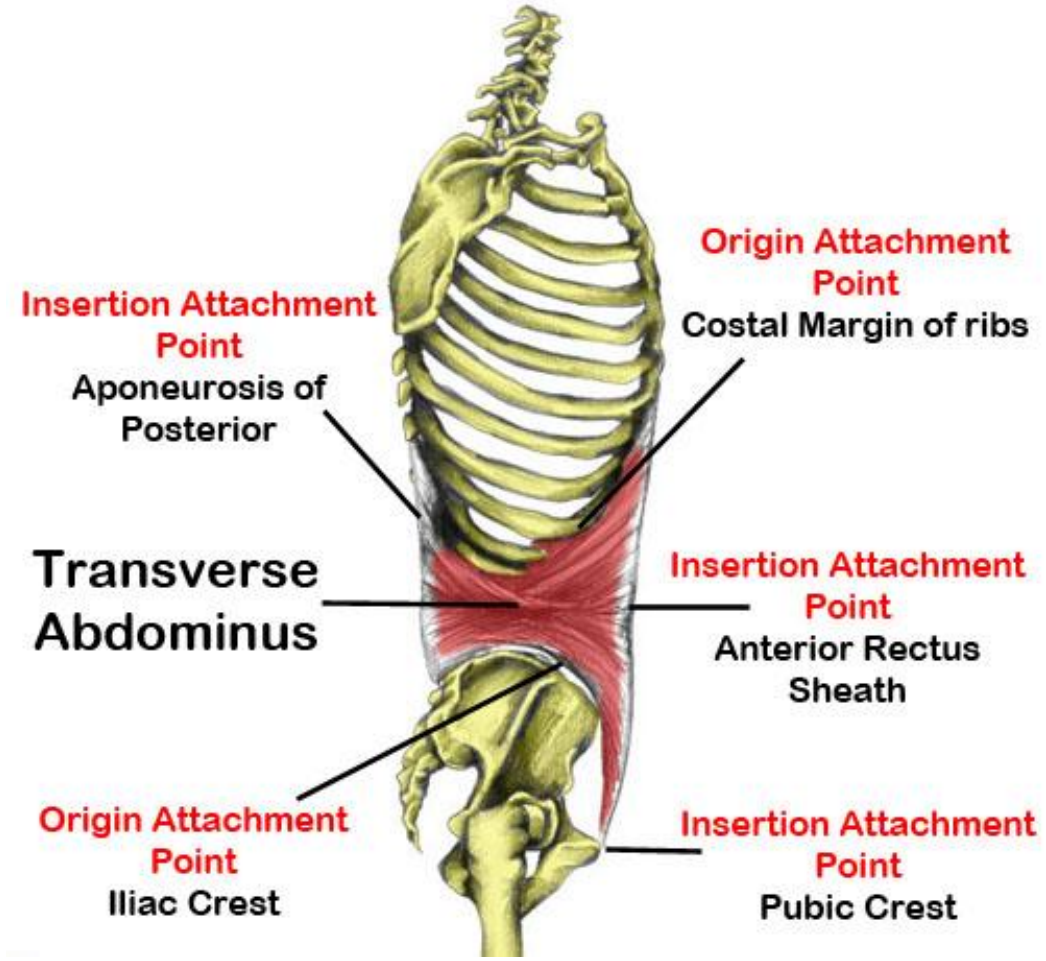


Fig 3. Anatomy of Transverse Abdomius

It is inserted into the xiphoid process, the linea alba, and the symphysis pubis. The lowest tendinous fibers join similar fibers from the internal oblique to form the conjoint tendon, which forms roof of inguinal canal .

Rectus Abdominis[18]

The rectus abdominis is a long strap muscle that extends along the whole length of the anterior abdominal wall. It is broader above and lies close to the midline, being separated from its fellow by the linea alba. The rectus abdominis muscle arises by two heads, from the front of the

symphysis pubis and from the pubic crest. It is inserted into the 5th, 6th, and 7thcostal cartilages and the xiphoid process . When it contracts, its lateral margin forms a curved ridge that can be palpated and often seen and is termed the **linea semilunaris**. This extends from the tip of the ninth costal cartilage to the pubic tubercle.

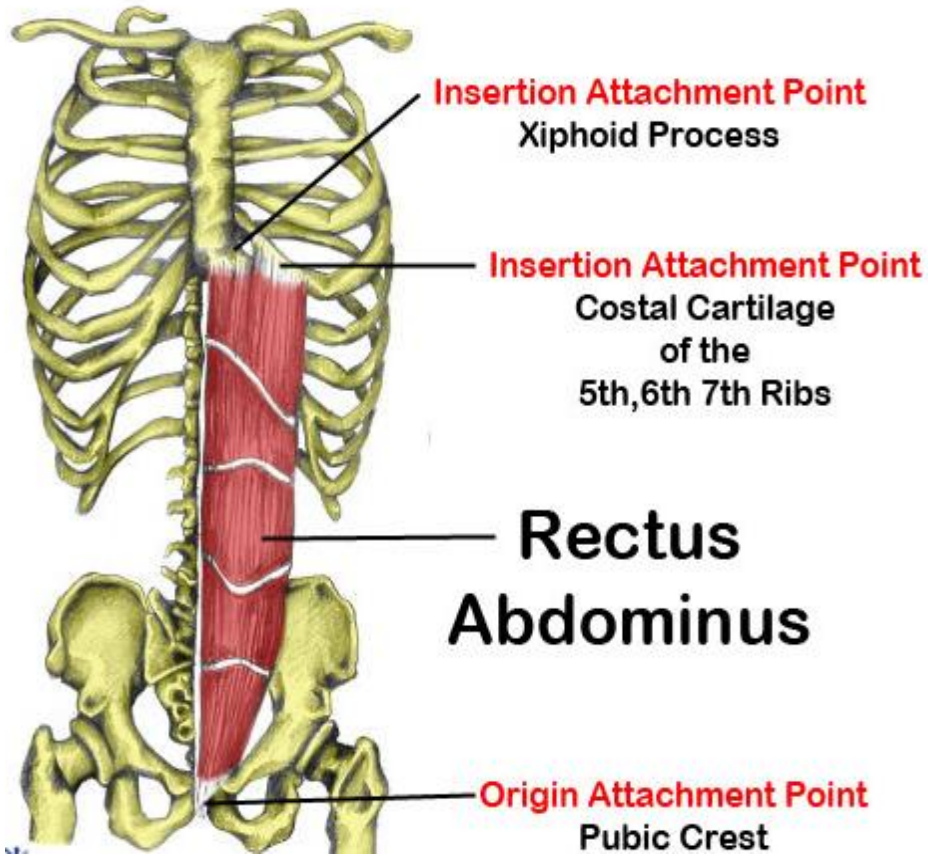


Fig 4. Anatomy of Rectus Abdomius

The rectus abdominis muscle is divided into distinct segments by three transverse **tendinous intersections:** one at the level of the xiphoid process, one at the level of the umbilicus, and one halfway between these two . These intersections are strongly attached to the anterior wall of the **rectus sheath**. The rectus abdominis is enclosed between the aponeuroses

of the external oblique, internal oblique, and transversus, which form the rectus sheath.

Pyramidalis

The pyramidalis muscle is often absent. It arises by its base from the anterior surface of the pubis and is inserted into the linea alba . It lies in front of the lower part of the rectus abdominis.

Rectus Sheath [19]

The rectus sheath is a long fibrous sheath that encloses the rectus abdominis muscle and pyramidalis muscle and contains the anterior rami of the lower six thoracic nerves, the superior and inferior epigastric vessels and lymph nodes. It is formed mainly by the aponeuroses of the three lateral abdominal muscles.

For ease of understanding, the rectus sheath is considered at three levels.

- Above the costal margin, the anterior wall is formed by the aponeurosis of the external oblique. The posterior wall is formed by the thoracic wall—that is, the 5th, 6^{th} and 7th costal cartilages and the intercostal spaces.
- Between the costal margin and the level of the anterior superior iliac spine, the aponeurosis of the internal oblique splits to enclose the rectus muscle; the external oblique aponeurosis is directed in

front of the muscle, and the transversus aponeurosis is directed behind the muscle.

- Between the level of the anteriosuperior iliac spine and the pubis, the aponeuroses of all three muscles forms the anterior wall. The posterior wall is absent, and the rectus muscle lies in contact with the fascia transversalis.

Inguinal Canal[20]

The inguinal canal is an oblique passage through the lower part of the anterior abdominal wall. In the males, it allows passage of structure from the testis to the abdomen. In females, it gives the pathway for round ligament of the uterus to pass from the uterus to the labium majora. That is about 4cm long in the adult and extends from the deep inguinal ring, a opening in the fascia transversalis downward and medially to the superficial inguinal ring, a hole in the aponeurosis of the external oblique muscle. It lies parallel to and above the inguinal ligament. In the newborn child, the deep ring directly posterior to the superficial ring so that the canal is shorter in children[21].

The **deep inguinal ring,** an oval opening in the fascia transversalis, lies about 0.5 inch above the inguinal ligament midway between the anterior superior iliac spine and the symphysis pubis . Lies medially are the inferior epigastric vessels, which arise from external iliac vessels. The

margins of the ring give attachment to the **internal spermatic fascia** (or the internal covering of the round ligament of the uterus)[22].

The **superficial inguinal ring** is a triangular-shaped opening in the aponeurosis of the external oblique muscle and situated above and medial to the pubic tubercle. The margins of the ring, sometimes called the **crura,** give attachment to the **external spermatic fascia[23].**

Walls of the Inguinal Canal

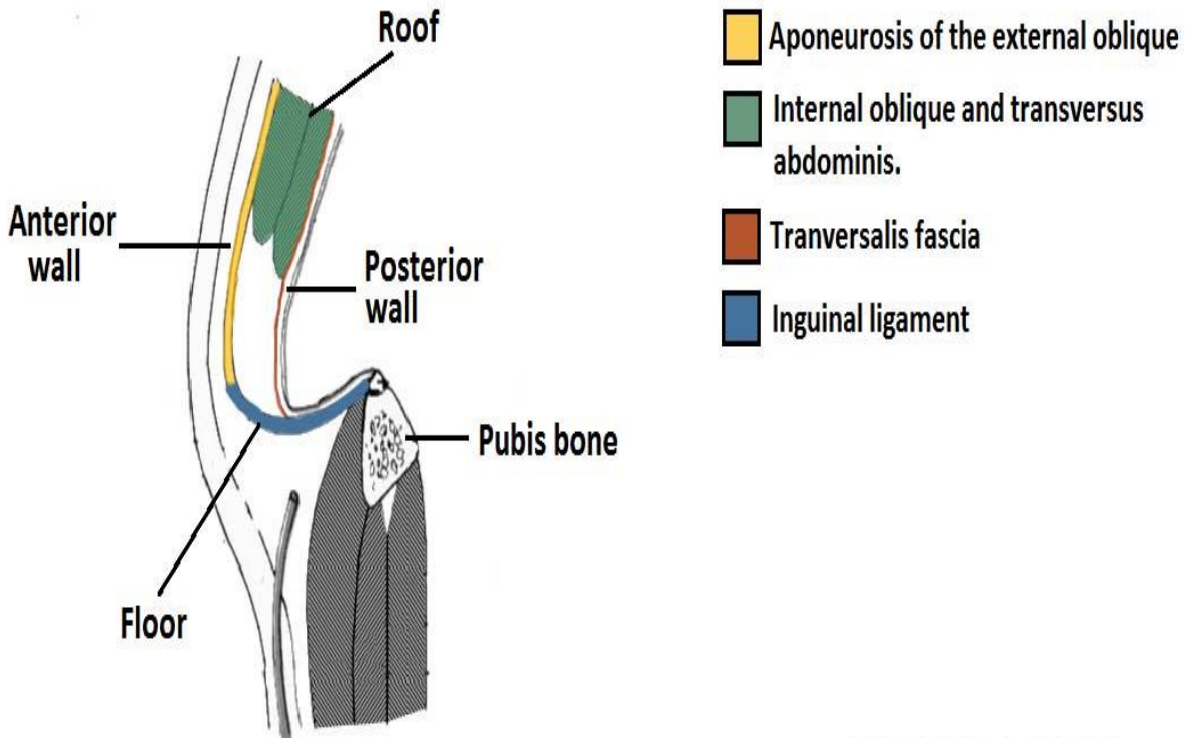


Fig 4. Anatomy of Inguinal Canal

Anterior wall: It is regarded as one of the strongest wall. It covers the weak area in lower abdomen the deep inguinal ring. External oblique muscle and aponeurosis with orgin of internal oblique from lateral aspect of inguinal ligament form the anterior structure.

Posterior wall. It is also a strong boundary. It completely covers the superficial inguinal ring. It is formed by fascia transverslis with contribution from conjoint muscle medially.

Roof or superior wall. From the insertion of internal oblique some muscle fibre contribute along with the transversalis abdominis to form the conjoint muscle.

Floor or inferior wall. The medial part of inguinal ligament is called lacunar ligament. This along with lower free border inguinal ligament forms the floor.

Mechanics of the Inguinal Canal[24]

The inguinal canal is an oblique passage through the lower part of the anterior abdominal wall. In the males, It allow passage of structure from the testis to the abdomen. In females, it gives the pathway for round ligament of the uterus to pass from the uterus to the labium majora.

The inguinal canal which lies in the lower anterior abdominal wall is regarded as a site of potential weakness in male and females. But nature has its own mechanism to tide over this weakness.

1. The oblique nature of the canal doesn't allow the weakest part the lower abdomen internal ring and superficial ring to lie opposite to each other.
2. The deep ring is covered by conjoint tendon and protects it when intra abdominal pressure rises.

3. The posterior wall with its counterpart conjoint muscle protects the superficial ring.
4. During intra abdominal pressure increases, the roof of canal that is the conjoint muscle collapses and become a flat structure that compress the inguinal canal. The compressed inguinal canal in turn prevents the intra abdominal content to enter into the canal.
5. When we do the squatting position during excessive straining like parturition the hip joints lies in a flexed position with thighs lying against the anterior abdominal wall. This manoeuvour thus protect weakened lower abdomen .

Femoral Canal[25]

The boundaries of the femoral canal are the inguinal ligament anterosuperiorily, pectineal ligament posteriorly, lacunar ligament medially and the femoral vein laterally. The femoral hernia passes through this triangle , with apex lies at the pubic tubercle, laterally the great femoral vessels of thigh.

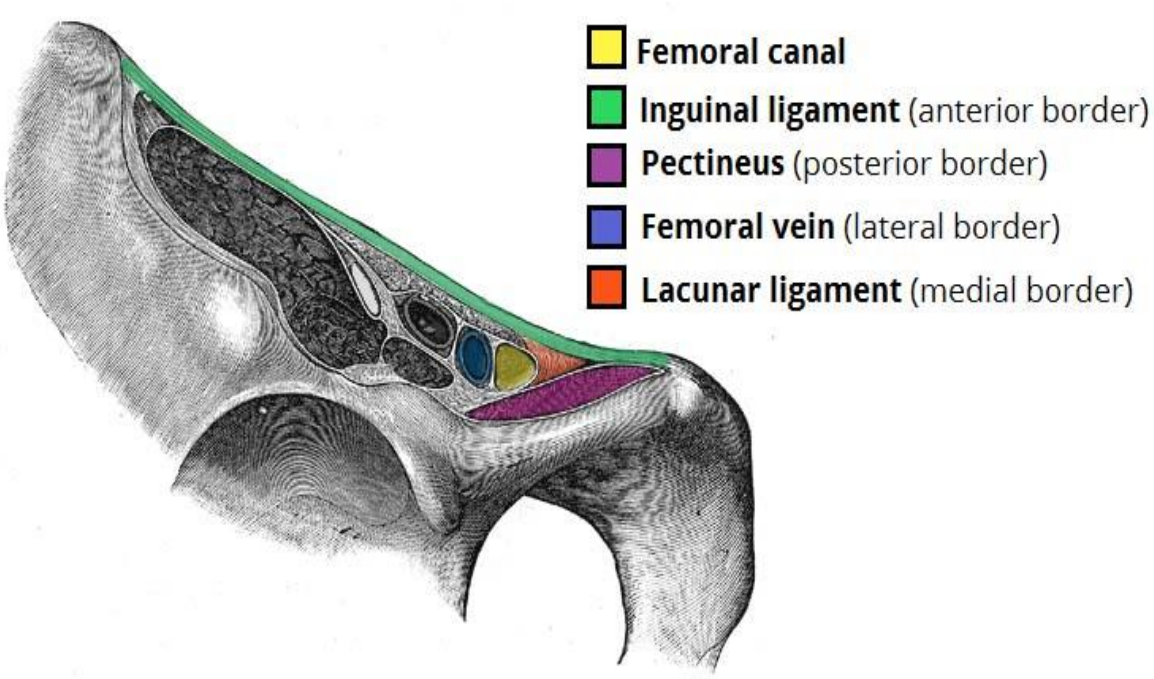


Fig 5. Anatomy of Femoral Canal

• **Fruchaud's Myopectineal Orifice** [26]

Traditionally the hernias of the groin have been defined as separate entities, which create confusion. Fruchaud's concept of the anatomy of hernias of the groin is important. Rather than dividing inguinal hernia as direct, indirect, femoral etc. Fruchaud believes that all lower abdominal hernia orginate from this weak area that he coined as the myopectineal orifice.

The myopectineal orifice is bounded by illiopsoas mucle, a flexor of thigh laterally, the roof is formed by the internal oblique muscle and the transverse abdominal muscle, the rectus sheath with muscle inside forms the medial boundary, and inferiorly by the pecten pubis.

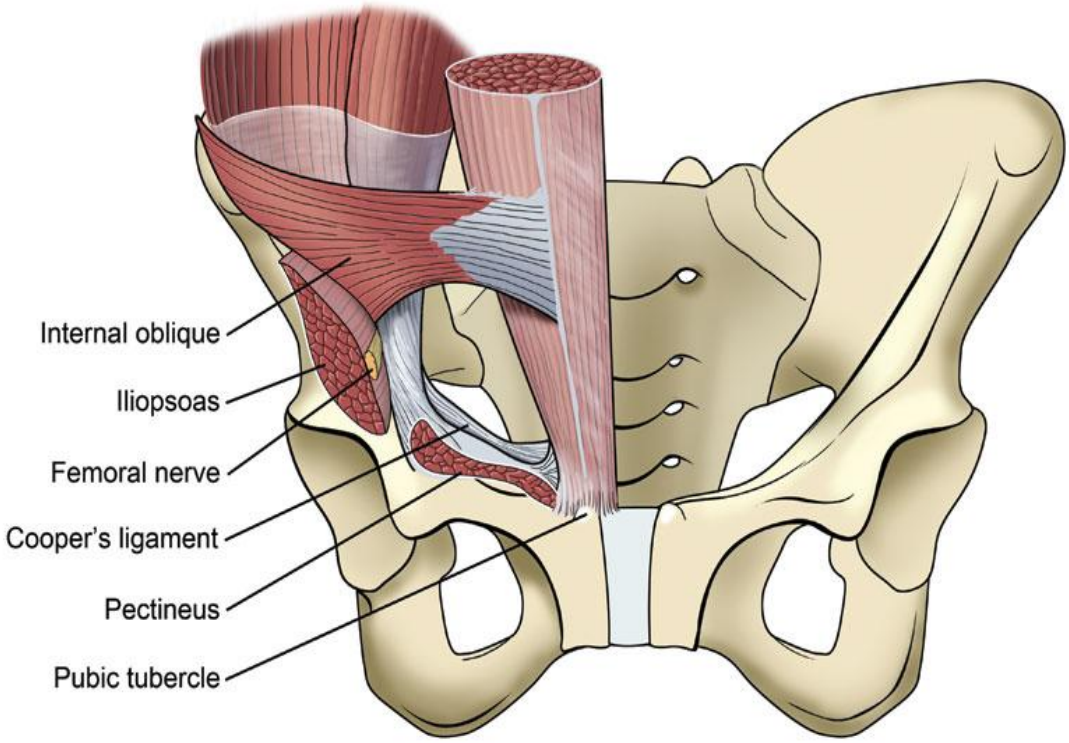


Fig 6. Anatomy of Fruchaud's Myopectineal Orifice

This bony muscular structure will be bridged and bisected by the inguinal ligament, pathway for spermatic cord and femoral vessels and safeguarded posteriorily by transversalis fascia. Therefore the rectitude of the myopectineal orifice is hang on the transversalis fascia. A groin hernia when there is a breach in the transversalis fascia spanning the myopectineal orifice allowing the peritoneal sac to come out. Thus weakness in the transversalis fascia is the main pathology of lower abdominal hernias.

Nerves in the groin area[27]

The groin area is richly supplied by nerves. The illio inguinal and illio hypogastric nerves are branches of L1which supply inguinal and

groin area. The genital branch supply the lateral aspect of scrotum and cremaster muscle. The labia is also innervated by genital branch of genitofemoral nerve. This nerve along with cremaster vessels at illio pubic tract forms a neurovascular bundle.

Risk Factors

- There are several known risk factors, which can leads an individual developing an inguinal hernia. A non-exhaustive list is presented below:
- **Male gender:** Males are far more prone to developing an inguinal hernia than females due to anatomical features.
- **Family history:** The risk of developing an inguinal hernia increases if an individual had a first degree relative (parents/siblings) with the same condition .
- **Obesity:** Moderate or severe obesity can result in constant increase pressure in the abdomen, which can contribute to the development of a hernia .
- **Pregnancy:** This can leads to weakening of the abdominal muscles and can also result in increased pressure inside the abdomen .
- **Comorbidities:** Having a condition such as cystic fibrosis, chronic obstructive pulmonary disorders (COPD), or other pulmonary disorders which cause excessive coughing and pressure in the

abdomen, can result in an inguinal hernia due to repetitive excess pressure in the abdominal wall.

- **Chronic cough:** A chronic cough due to a medical condition (usually chronic), or due to smoking, increases risk of developing an inguinal hernia due to repetitive straining and pressure in the abdominal cavity .
- **Smoking:** Studies of connective tissue which has been obtained from inguinal hernia patients have shown that smoking induces hernial formation as a result of defect in the connective tissue metabolism. It has also been reported that smoking is a significant risk factor for recurrence of inguinal hernias, also probably due to defective connective tissue metabolism seen in smokers.
- **Chronic constipation:** This condition can lead to straining during bowel movements and this can lead to the formation of an inguinal hernia. Straining during urination can also result in inguinal hernia..
- **Previous abdominal surgeries:** Well known risk factor due to injury to illeo inguinal nerve and subsequent muscle weakness.
- **Vocational exertion:** Individuals with jobs that require them to stand for prolong periods of time or engage in heavy physical labour can potentially be at an increased risk of developing an inguinal hernia .

Classification systems of groin hernias

The hernia surgery the recurrence depends upon the pathology. In a direct hernia if the defect is large the chance of recurrence compared to a small indirect hernia is 5:1. So groin hernia must be classified in a uniformily accepted manner. It should able to explain the underlying pathology and clinical features.

The classification must localise the defect , it size and should clearly define the strength of the posterior inguinal wall.

The Following are some of the commonest classification systems around:

1. STOPPA'S CLASSIFICATION[28]

Type I

Indirect hernia with a normal internal Ring measuring less than 2 cm. Inguinal floor is normal

Type II

Indirect hernia with deep ring > 2cm inguinal floor is normal

Type III

Indirect hernia/ direct hernia/ femoral hernia with a weak inguinal floor

Type IV

Recurrent hernia

2. NYHUS CLASSIFICATION [29]

Type I

Indirect inguinal hernia— here the deep ring is normal

(e.g. hernia in pediatric age group)

Type II

Indirect inguinal hernia— here the deep ring is found to be dilated but posterior wall of inguinal canal is normal. The inferior epigastric vessel remains intact.

Type III

Pathology lies on posterior wall

A Defect can be at hesselbacks triangle that is direct hernia

B Pantaloon hernia

C Femoral henia

Type IV

This type is for recurrent hernias

A for Direct hernia

B for indirect hernia

C for Femoral hernia

D Combined

3. GILBERT CLASSIFICATION[30]

Type I

Hernia through a relaxed internal ring through which peritoneal content travel out as indirect hernia.

Type II

Through a dilated internal ring which admits one finger but not two finger. Hernia appear only on raised intra abdominal pressure after reduction.

TypeIII

Hernia passes through dilated internal ring which permits more than two finger breadth. Hernia reappear soon after reduction without an impulse.

Type IV

Its for Direct hernia as a result of blow out defect in the posterior boundary of inguinal canal. Deep ring is normal.

Type V

Direct hernia through punched out anomally in the transversalis fascia. Deep ring is normal.

Type VI

Combined hernia

Type VII

Femoral hernia

4. EUROPEAN HERNIA SOCIETY (EHS) CLASSIFICATION [31]

EHS groin hernia classification

P/ R

0 1 2 3

L

M

F

As shown in the table above, 1, 2 and 3 indicate the diameter of hernia orifice. 1 means it admits 1 finger, 2 means it admits more than 1 finger and less than 3 finger and 3 means it admit 3 or more fingers. Thus a hernia orifice of 1.5 cm is regarde as a size 2 hernia. Based on relation with inferior epigastric vessel L means direct hernia and M means indirect inguinal hernia. F is abbreviated to femoral hernia. If the hernia is combined it is depicted by ticking the appropriate box. In this classification P represent primary hernia and R represent recurrent hernia.

5. ANATOMICAL CLASSIFICATION OF INGUINAL HERNIA

Type I Hernial sac passes through indirect inguinal ring which lies lateral to inferior epigastric artery

Type II Hernia passes through posterior wall of inguinal canal hesselbachs triangle, which lies medial to inferior epigastric artery.

6. CLASSIFICATION ACCORDING TO EXTENT

Type I Bubonocele. Here sac is confined to inguinal canal.

Type II Funicular. Here sac crosses the superficial inguinal ring but after entering the scrotum it doesn't reach the base.

Type III Complete .Here sac travels upto the base of the scrotum.

COMPOSITION OF A HERNIA [32]

In general hernia made up of 3 anatomical part.

1) The sac. Its a peritoneal fold, it has 3 parts: the neck , the fundus and the body. The direct hernia and incisional hernia has no neck, in indirect hernia diameter of neck determines the risk of strangulation. If the hernial contents undergo strangulation it's better to open the fundus of sac, to avoid infectious fluid to spell into peritoneal cavity. The body of the sac has high variation. In long-standing hernia the wall of the sac will be indurated.
2) The coverings: They are derived from structures around the sac, in inguinal hernia its formed by anterior abdominal wall layers.
3) The Contents: These could be any of the following:
    - Omentum = named as omentocele.

- Intestine = enterocele. If it is appendix named as amaydles hernia. Usually it contain small intestine.
- A portion of the circumference of the intestine = Richter's hernia;
- Some times the bladder with or without sigmoid colon will form the contents of a inguinal hernia, which is called sliding hernia
- Ovary with or without fallopian tube.
- A Meckel's diverticulum sometimes seen in hernia sac and is called Littre's hernia

1.8 Presentation of Inguinal hernias

Patients with lower abdominal hernia present in a innumerable ways, from the asymptomatic swelling which increases in size on straining and disappear when lies down will be the common presentation which is seen in about 30% of patients. Dull aching pain along with swelling which is worst during exertion or at night time accounts for 2/3 rd of patients. Severe pain in groin hernia is a clue to its complication like strangulation/ irreducibility with obstruction.

Why the hernia patient experience dull aching pain which is worst during straining like coughing, lifting and defecation is probably due to raised intra abdominal pressure reflection. When intra abdominal pressure increases more content enter into the sac raising the discomfort. Pain occurs when the hernial ring compromises the vascular supply, which

increase the production of lactic acid with local vasodilator property to tide over the acute situation. Sometimes this mechanism doesn't be enough and henial content undergoes strangulation.

There is a direct relation with painful presentation with duration of disease. The patients who has a hernia for 10 years 90% will be complaining of pain. In indirect inguinal hernia as content passes through two rigid rings that is superficial and deep ring they are more common for complication and pain as compared to direct were neck is wide and around 6% of patients will have features of obstruction at the time of presentation.

For those patients presenting with an acute hernia the symptoms vary according to the pathology within the hernia and the presentation could be as follows.

1. **Irreducible hernia:** Hernia with contents doesn't return to the abdomen by its own or cannot be pushed back by the patient or doctor is called irreducible hernia. In this situation there will be no evidence of obstruction or strangulation. It is usually due to adhesions between the sac and its contents or due to over crowding of content within the sac. Irreducibility without other symptoms is almost diagnostic of an omentocele, and any degree of irreducibility predisposes to strangulation.

2. **Obstructed hernia:** Here the patient presented with features of intestinal obstruction. On groin one can very well see an irreducible inguinal hernia with area of tenderness. Usually its an enterocoele which is obstructed by the narrow neck or overcrowding within the sac. The patient will have colicky pain, vomiting and abdominal distension. If the pain become severe and tenderness increases one should suspect strangulation. The treatment of obstructed hernia is emergency surgical correction after stabilising the patient.

    Incarcerated hernia is medical term used to describe when a portion of the colon is obstructed by hard stools. Here the indentation test is positive.

3. **Strangulated hernia:** a strangulated inguinal hernia is a medical emergency. It usually occurs after the irreducibility and obstruction sets in. Here the narrow rigid neck compresses the venous channel resulting in congestion and oedema of the bowel. There will accumulation of exudates in the sac which compromise further by impending the arterial supply as well.

    The whole cycle can leads to bowel necrosis in around 4-5 hours. In groin hernia through deep ring and femoral ring are more prone for strangulation.

The patient will be presented with features of intestinal obstruction along with severe pain in the groin not respond to analgesics. On examination patient may be febrile, there will be tachycardia and tachypnoea. The skin over the groin will show discoloration with severe tenderness. Here cough impulse will be absent.

Hence, all patients presenting with bowel obstruction require a thorough physical examination of the groin region for inguinal and femoral hernias. If there is no bowel in the hernia sac, an incarcerated groin hernia may alternatively present as a hard, painful mass that is tender to palpation. The physical exam differs between an incarcerated and a strangulated hernia. The incarcerated hernia may be mildly tender due to venous congestion from the tight defect. The strangulated hernia will be tender and warm and may have surrounding skin erythema secondary to the inflammatory reaction from the ischemic bowel. The patient with the strangulated hernia may have a fever, hypotension from early bacteraemia, and a leuckocytosis.

The incarcerated hernia requires operation on an urgent basis within 6 to 12 hours of presentation. If the operation is delayed for any reason, serial physical exams are mandated to follow any change in the hernia site indicating the onset of impaired viability. The strangulated

hernia clearly requires emergency operation immediately following diagnosis.

Diagnosis

History and Clinical Examination:

The diagnosis of groin hernia is essentially clinical. The patient should be thoroughly examined both in standing and supine position. Any risk factor for hernia such as constipation, micturition difficulty and chronic cough should be elicited. The abdominal condition like previous surgery especially for appendix, abdominal tumour, ascitis should be included in history taking.

It is very important to inspect groin area in all patient presented with features of intestinal obstruction or peritonitis. If the inguinal region appears normal, ask the patient to cough or strain. If there is hernia there will be impulse on coughing.

Some specific tests are there to differentiate various type of hernia. In case of femoral hernia the bulge will be present lateral and below the pubic tubercle. In deep ring test, the patient is first asked to lie down and the hernia is reduced. After explaining the test, the patient is asked to stand up with deep ring occluded by thump. Ask the patient to cough, if bulge appears that means deep ring occlusion test is negative or the patient is having direct inguinal hernia. It’s the confirmatory test to differentiate indirect from direct hernia. Other test which are of less use-

full are Ziemans test and finger invagination test. This division is not important, because hernia is repaired through same incision and steps of hernia surgery are almost similar.

If the hernia is complete in nature, it must be differentiate from hydrocele. In inguinal hernia the cord structure is palpable at the root of the scrotum. The testis will be also palpable on either side in case of hernia. In hernia there will be impulse on coughing. Less reliable test is transilumination test; here a torch light is placed over the swelling in the dark room. If the swelling allow passage of light the test is positive. Usually hydrocele is brilliantly transluminent swelling.

Since inguinal hernia is a common diagnosis, some clinician misdiagnose femoral hernia, spigelian hernia or saphena varix as inguinal hernia. In this all situation cough impulse will be possible. So proper clinical examination is vital to diagnose inguinal hernia. The other clinical situation is to decide to whether to go with bilateral hernia repair or not. Unilateral hernia increases the risk upto 33% on other side. So a patient diagnose to have unilateral hernia and opposite side is weak it's better to do bilateral hernia repair. Some laparoscopic surgeon advice bilateral hernia repair for all cases, but this concept is not widely accepted.

Investigations

The inguinal hernia is clinical diagnosis. USG can be used to differentiate inguinal hernia from the femoral hernia or other swelling in the groin area. If the diagnosis is confirmed, USG can diagnosis type of hernia indirect or direct though exact specification is seldom needed. Herniography is no longer justified due to its invasiveness.

The situation may arise when inguinal hernia may present as an irreducible mass lower abdomen. In this situation the cough impulse test will be negative. So to get a correct diagnose it may be essential to do USG and CT scan abdomen.

Differential diagnosis[33]

The differential diagnosis if an groin hernia includes the following:

1. Femoral hernia
2. Hydrocele
3. Undesecended testicle
4. Lymph node
5. Lipoma
6. Femoral artery aneurysm
7. Saphena varix.

Prosthetic Material for Hernioplasty

Knowledge of the different prosthetic materials seems essential as some of these meshes have been reason for chronic post surgical pain.

The use of mesh in hernia repair has become the standard repair world wide. This was based on the definite reduction in recurrence rates as well as post operative pain scores in these patients. Early in the 20th century Billroth said ‘ if an adequate tissue replacement is identified, the problem of hernia would no longer exist’ this triggered a search for an ideal tissue replacement, and since then several materials have emerged as suitable for routine use in hernia surgery, as they fulfill the characteristics of an ideal prosthesis

1. Not modified physically by tissue fluid.
2. Chemically inert.
3. Does not leads to an inflammatory or foreign body reaction.
4. Does not cause carcinogenesis.
5. Does not cause allergic or hypersensitivity responses.
6. Resistant to mechanical strain.
7. Conformable.
8. Sterilizable.

Meshes are broadly classified into two type

Biological mesh and Synthetic mesh

Biological mesh: They are sterile, decellularised, non immunogenic connective tissue. They are derived from dermis of human or animal, bovine pericardium or porcine intestinal submucosa. They cause

neovascularisation and collagen deposition before they are broken down by biological enzymes.

Synthetic mesh: They are made up of polypropylene, polyester or polytetrafluroethylene. The polypropylene is monofilament and hydrophobic which prevent growth of microorganism but cause influx of fibroblast resulting in collagen deposition and form a strong barrier. Polyester mesh is braided filament mesh which is hydrophilic and allow bacteria to grow, but this property also aid rapid growth of fibroblast and neovascularisation holding the infection. PTFE is a flat sheet which does not cause any tissue in growth.

Tissue separating mesh. They are mesh with one side coated with polycellulose, collagen and PTFE which prevent adhesion by forming sticky surface. They are used as intraperitoneal mesh.

Position of mesh

Onlay: just outside the muscle in subcutaneous plane

Inlay: mesh is kept within the defect

Sublay: mesh is kept between the fascial plane or kept against the mesh or fascia extraperitoneally.

Treatment of Inguinal Hernia

The treatment of groin hernia is the most common surgical repair a general surgeon is asked to perform**.** The treatment should be offered to all patient unless there is special contra indication exist. In an elderly

patient harbouring non complicated direct hernia can be wait and watch. Since in modern days local anaesthesia is enough to perform this type of sugeries, surgical repair should be the first treatment option. Morbidity and mortality associated with elective groin hernia repair is much less than that with complicated one. If the hernia undergoes strangulation, the mortality rate approaches 5 %.

Non operative Management

There is no role for non operative management. The truss which is used in the past only has a historical significance. As already mentioned the direct hernia in the elderly male can be watch and wait.

Operative Management

General considerations

There are various methods for hernia repair, to choose an ideal method depends on ones experience and level of training. In paediatric age group herniotomy is only needed. Mesh repair has its own advantage of less recurrence rate, but it’s not suited in a complicated strangulated hernia due to risk of infection. The recurrence rate and complication rate of mesh repair is less than 1 %. In the vicinity of infection its better to do herniorraphy. Lytres repair may be needed if deep ring is found dilated. The laparoscopic hernia repair has its own advantage compared to open method. It has less post operative pain and early return to work compared

to open method. It’s not suitable in patient who are not able to tolerate general anaesthesia.

The major indication for a surgeon to choose any one inguinal hernia repair over another is personal experience with a particular operation. Thus, in theory, any patient can be considered a candidate for any of these procedures. Some general guidelines are useful. The overriding consideration should be the need to tailor the operation to the patient's particular hernia. For example, a simple Marcy repair would be completely adequate for a paediatric patient with a Nyhus type 1 hernia but not for an elderly patient who has an indirect hernia in conjunction with extensive destruction of the inguinal floor. The giant prosthetic reinforcement of the visceral sac (GPRVS), is a hernia surgery which is done when there is post abdominal wall weakness and bilateral huge hernia.

The contraindication for surgery is a few, since hernia repair can be done under local anaesthesia. The patient refusal and uncontrolled coagulopathy are two main contraindications. There are two approach for hernia surgery the anterior and posterior.

ANTERIOR APPROACH

Anaesthesia

The choice of anaesthesia is crucial in proper planning of hernia surgery. In paediatric age group its better to go with general anaesthesia

as they will not tolerate pain. In anxious, noncooperative patient better to give regional or general anaesthesia. The local anaesthesia is preferred method in patient who have systemically compromised such as having cardiovascular disease, copd , uncontrolled hypertension etc.

The post operative complications are less with local anaesthesia. They can be early mobilised, less urinary retention and coast is also considerable. It can be done as a day care surgery. The hernia clinics in most of the western countries prefer local anaesthesia. A combined long acting and short acting drug is given. First skin and subcutaneous tissue is infiltrated with local anaesthetic, after visualising the external oblique deeper structure is also infiltrated.

Operative technique

The operative procedure in hernia is eventhough innumerable, each technique follow some basic steps. Whether it use any prosthetic material or not, type of anaesthesia, irrespective of age and sex. Careful handling of cord reduces post operative oedema and discomfort to the patient. By careful dissection and safe guarding the major nerves can prevent the post operative pain and chronic pain.

In general first pubic tubercle and anterior superior iliac spine is marked. An incision usually oblique is placed, some times in modern era of cosmetics the surgeon prefers horizontal incision and skin is incised. Followed by fatty campers and scarpas membraneous layer, deep fascia is

incised and external oblique aponeurosis is identified by white glistening structure.

The external oblique aponeurosis is opened by creating a small incision using 11 bade. The incision is then extend on either side both medially and laterally. Laterally it should cross the deep inguinal ring and medially it should reach up to superficial inguinal ring. Then upper and lower flaps are raised. The upper flap is raised underneath the rectus sheath medially and internal oblique muscle laterally. The lower flap was raised upto the inguinal ligament.

The illiohypogastric and illioinguinal nerve can be identified beneath the external oblique at this time. It is better to preserve both this nerve rather than cutting it or taking bite over it. It is usually separated by blunt dissection and safe guarded from the operative field.

After safe guarding the nerve the cremaster muscle is identified. laterally it is attached to inguinal ligament , but medially it is free. The cremaster muscle is opened longitudinally using electro cautery. The cremaster opened in the whole length. After opening cremaster and attaining haemostasis the cord structure is hooked out by passing index finger of right hand at superficial inguinal ring meets with other finger from opposite hand.

The cord structure is then slowly and completely mobilised up to deep ring. The cord structure is dissected to identify the sac. Sac is

usually pearly white in colour. The sac is completely freed from cord structure. The cord structures are lateralised. The sac is opened and content are reduced. The sac is ligated and excess sac is excised. Some surgeon doesn't believe in excision of sac as they can cause post operative pain. They believe in reduction of the sac.

After dealing with sac, the operation is preceded depending upon the type of surgery. The superficial ring should be dilated enough to prevent the strangulation of the cord structure. After that scarpa fascia is closed followed by skin.

Details of Specific Repairs

***1*. Marcy repair [34]**

The Marcy repair is the non prosthetic repair done for paediatric hernias. Here a sleeve like incision is made along the internal spermatic fascia. The sac is dissected out. The spermatic fascia closed using non absorbable material. The dilated internal ring is narrowed using the same suture material. One of the major indications for this type of repair is nyhus type 1 inguinal hernia.

***2*. Bassini repair[35]**

Edoardo Bassini (1844-1924) is the first person to strengthen the posterior abdominal wall. Initial steps of Bassin's repair are same as that of conventional surgery. Here after high ligation and reducing the sac. The conjoint tendon is sutured to inguinal ligament using non absorbable

suture material. The first bite is taken from the pubic tubercle which he called as the key bite.

At the time of Bassini this was a revolutionary surgery with acceptable recurrence rate. The key to surgery is the use of non absorbable suture material. If absorbable suture material is used its tensile strength will be lost in days to weeks. After strengthening the posterior wall the external oblique , scarpa and skin layer. Long term result is excellent in good hands.

3. **McVay (Cooper's ligament) repair** [36]

A relaxing incision is made over the rectus sheath above pubic tubercle upto 4 cm after completion of this procedure. It's a pure non prosthetic repair were non absorbable suture material used to oppose the transversalis fascia to coppers ligament still it reaches the femoral ring. Lateral to femoral ring the transversalis fascia is approximated to illio pubic tract upto the entrance of cord. It helps to repair all 3 hernias direct, indirect and femoral .

4. **Maloney darn** [37]

The nylon darn repair is strengthening the posterior wall of inguinal canal by approximating the conjoint tendon to inguinal ligament by continues sutures in a darn shaped manner. This is followed by closure of external oblique scarpa fascia and skin in a routine manner.

5.Shouldice repair [38]

It's a multi layer repair. It can be done under local anaesthesia. After doing herniotomy, the transversalis fascia is incised from deep ring to pubic tubercle. The lower flap is sutured to post part of upper flap. The upper flap is sutured to inguinal ligament, followed by conjoint tendon approximated to inguinal ligament in two layers. As a last step the external oblique aponeurosis closed in two layers in front of the cord. Hence its a six layer repair. The suture material used is polypropylene or polyethylene. The recurrence rate is only less than 1%.

6. **Lichtenstein repair** [39]

The tension-free mesh repair first introduced in 1984 by Lichtenstein and colleagues. The operation is a prosthetic mesh repair by strengthening the posterior abdominal wall. It usually uses prolene mesh. Long term outcome of this surgery is found to less recurrent rate, for patient view it is associated with less chronic pain and early return to normal activity.

It is the most widely used hernia repair today. The steps and technique of this repair is almost similar. After opening the external oblique aponeurosis the cremaster is opened. The cord structure is lateralised if it is a direct hernia. In indirect cord structure and sac are dissected out. Sac opened content reduced. The neck of sac ligated. The excess sac excised, conjoint tendon is resutured.

Followed by this a prolene mesh is placed over the inguinal floor. Usual length of mesh used is 6x8 cm. Mesh should cross the deep inguinal and 1cm medial to pubic tubercle. The mesh is transfixed to posterior abdominal wall using 1-0 prolene. First bite is taken at the pubic tubercle , followed by continuous suture into inguinal ligament. The prolene mesh is transfixed to fascia transversalis.

A fish tail is created at the lateral end, dividing the mesh into upper $2/3^{rd}$ and lower $1/3^{rd}$ creating a shutter valve. This step is essential for preventing the recurrences. After creating the fish tail the mesh is sutured to inguinal ligament using single interrupted suture. The mesh should be loose over the inguinal region to ensure that there is no tension over the mesh even when patient stands upright.

The illioinguinal nerve and illiohypogastric runs below the mesh and care should be taken to avoid stitches around that vicinity to prevent chronic pain and neuralgia. Some surgeons avoid bite directly over bone to avoid pubic osteitis, they take first bite from the lateral end of rectus muscle.

After placing the mesh the external oblique is closed in a routine continuous absorbable sutures, followed by approximation of Scarpas membrane and skin.

In their series of 4,000 patients, Lichtenstein and colleagues recorded a recurrence rate of 0.1%, including procedures for recurrent

hernias; other complications occurred only rarely. Other authors who used this technique outside the Lichtenstein clinic have reported low recurrence rates, indicating that good results are reproducible outside specialist units

7. Plug and Patch repair [40]

This technique was first introduced by Gilbert. Here incision is made similar to other techniques. The sac is identified if there is indirect hernia. The content of the sac reduced. The excess sac ligated and excised. After that a sheet of polypropylene mesh is mould up like a cigar, tied, inserted into the defect, and fixed with interrupted sutures to either the deep ring (for an indirect hernia) or the neck of the defect (for a direct hernia).

A readymade prosthesis that has the shape of a flower is available, which is anchored to each patient's defective region by removing some of the "petals" to avoid unnecessary bulk. The role of suturing plugged mesh to posterior wall is matter of debate, most surgeon avoid suturing. But most surgeons use a single interrupted suture to fix the plug. This technique is easy to teach, is acclaimed to be as good as the Lichtenstein repair, and is said to be faster to perform which has made it popular in hernial centres.

2. POSTERIOR APPROACH

Preperitoneal Approach (Stoppa-Rignault-Wantz Repair - Giant Prosthetic Reinforcement of Visceral Sac GPRVS) [41]

The whole concept GPRVS is derived from Fruchaud, a scientist who first explained Fruchaud myopectineal orifice. He believe that all groin hernia occur due to weakness in this myopectineal orifice or in other words inability of the transversalis fascia to hold the peritoneal content. Stoppa was student of fruchaud, this lead him to develop this pre peritoneal repair.

Here a large prosthetic mesh is placed in the pre peritoneal layer over the fruchaud myopectineal orifice. The mesh is kept in such a way that it entirely replaces the weak transversalis fascia at this site. In this technique the anatomical type of hernia present is unimportant. Thus the preperitoneal layer is strengthened, the preperitoneal layer lies between the fascia transversalis and peritoneum. The transversus abdominis muscle and its aponeurosis and fascial coverings are probably the most important layer in the groin. The aim of hernia repairs should be to return this layer to normal. By strengthening the preperitoneal area, this goal can be achieved.

In 1983, the concept of reinforcement of the preperitoneal layer in the lower abdomen by introducing a large piece of mesh in this area was developed. This can be done through a transverse lower abdominal

incision. The peritoneum can be dissected far from the undersurface of the fascia transversalis to expose the defect through which the hernia protrudes. Alternatively, a lateral rectus approach via a transverse incision can be used to expose the defect. A few inches above the pubic tubercle, the rectus sheath can be incised and the rectus muscle is retracted medially.

Access is then gained to the preperitoneal space, through which the repair is performed using a large prosthesis that cross far beyond the margins of the myopectineal orifice and covers the visceral sac. The mesh is held intact by intra-abdominal pressure, which pushes outward toward the undersurface of the transversalis fascia. Later, as a consequence of connective tissue in-growth, the mesh becomes incorporated in the body tissues, which further strengthens this layer. The mesh also adheres to the peritoneum, so that the peritoneum cannot protrude through the parietal defect.

This technique works by preventing the peritoneum from bulging outward rather than by repairing abdominal wall defects. No sutures are placed in this method of hernia repair, and it is tension-free. Because the incision for a preperitoneal hernia repair is away from the groin area and directly accesses the preperitoneal space, dissection of the inguinal canal, spermatic cord, or sensory nerves of the groin is not performed. The

complications involving these structures that occur with other hernia repairs are very rare with the preperitoneal repair.

The mesh is made up of multifilament fibres of Dacron, which is soft, elastic, flexible, and rapidly integrated into tissue. Other meshes are not suitable because they are semi rigid and buckle when bent in two directions. In a bilateral repair, the chevron-shaped mesh is used which measure transversely 2cm less that two anterior superior iliac spine and vertically it corresponds to length from the umbilicus and the symphysis pubis. The mesh is placed in the preperitoneal space so that it underlies the rectus muscle for a width of about 2 to 3 cm and extends this same distance above the level of the myopectineal orifice in all directions. The pre peritoneal or posterior method for the repair of inguinal hernias is particularly useful with very large or recurrent hernias. Laparoscopic hernioplasty is an extension of the preperitoneal concept. In many of the laparoscopic repairs, the mesh is placed in the preperitoneal space.

3. LAPAROSCOPIC APPROACH[42]

The trans-abdominal preperitoneal (TAPP) and the totally extraperitoneal (TEP) laparoscopic inguinal herniorrhaphies are the most popular approaches. Both are modelled after the conventional preperitoneal operations. The major advantage of laparoscopy is that the preperitoneal space is entered through 10mm trocar sites at the

infraumbilicus rather than through a routine inguinal incision. This is followed by dissection of the preperitoneal space with placement of a mesh which is similar to the routine preperitoneal operation.

Transabdominal preperitoneal repair (TAPP)

The procedure is begun with a thorough diagnostic laparoscopy to rule out unrelated pathology and carefully inspect both myopectineal orifices. Two additional trochar are placed just lateral to the rectus muscle at the level of umbilicus. For a unilateral hernia, a transverse incision is begun at the lateral side of the medial umbilical ligament and extended to open its lateral leaf to the anterior superior iliac spine. If the medial umbilical ligament appears to compromise exposure, it can be divided. Electrocautery is used to minimize bleeding from the remnants of the embryologic umbilical artery. A complete dissection in the preperitoneal space is essential. It is usually performed with blunt dissection and liberal use of electrocautery, as bleeding in this area is particularly troublesome if it interferes with illumination. The ipsilateral and contra-lateral pubic bone with its tubercle, the inferior epigastric vessels, Mcvarys ligament, and the iliopubic tract are identified.

The cord structures are mobilized, and the peritoneal sac is dissected a few centimetres in front to the bifurcation of the vas deferens and the internal spermatic vessels. Recurrences have been attributed to inadequate mobilization of the peritoneal flap, which does not allow the

prosthesis to lie flat in this area. If small, an indirect sac is freed away from the cord structures and reduced. If large, the sac is divided at a convenient point distal to the deep ring and only the proximal portion is mobilized. A direct sac readily reduces during the preperitoneal dissection. An easily visible layer of fatty tissue separates the thinned out transversalis fascia lining the defect and the peritoneum.

A large piece of polypropylene mesh (at least 15 × 10 cm) is stapled in place, starting from the contra-lateral pubic tubercle medially and followed by anterior abdominal wall superiorly at least 2 cm above the hernia defect, to the anterior superior iliac spine laterally, and to Cooper's ligament inferiorly. Most surgeons prefer to fasten the prosthesis with staples or tacks. Some surgeons feel fixation is not necessary at all when a large prosthesis is used that covers the entire myopectineal orifice. Staples tacks are avoided below the iliopubic tract when lateral to the internal spermatic vessel because of the danger of damage to the important nerves in this area.

Damage to these nerves results in neuralgia, such as was commonly observed in the developmental stages of laparoscopic inguinal herniorrhaphy, before the anatomy of the preperitoneal space was appreciated from a laparoscopic perspective. To decrease further the incidence of neuralgia, in the superior border staplers are placed horizontally and when it come to laterally the staplers are placed

vertically. This is to avoid damage to lateral cutaneous nerve of thigh and femoral branch of genitofemoral nerve.

For bilateral inguinal hernias, the similar peritoneal incision and preperitoneal dissections are used. The symphysis pubis is visualised completely for proper communication with each other. This technique allows the placement of one large mesh (at least 25 ×7.5 cm) that essentially covers the entire lower abdomen.

B. Totally extraperitoneal repair (TEP)

With extra peritoneal laparoscopic inguinal hernia repair, the peritoneal cavity is not intentionally violated. An incision is made at the umbilicus, as if one were planning to perform open laparoscopy. The rectus sheath is opened at one side and the rectus muscle is pushed laterally. Blunt dissection is preceded in the space between the rectus muscle and the posterior rectus sheath. The space is enlarged by placing a blunt instrument blindly or an operating laparoscope (a rigid laparoscope with a working channel). Once the space is large enough, two additional cannulae are placed in the midline, one approximately 5 cm above the symphysis pubis and the other midway between the umbilicus and the symphysis pubis. The dissection of the preperitoneal space is completed under direct vision. The rest of the operation is identical to the TAPP procedure, described above.

Popular alternatives are to use a water- or air-filled balloon dissector to perform the preperitoneal dissection and to place the two accessory cannulae on either side of the umbilicus, as in the TAPP procedure, instead of in the midline. The presumed advantages of the TEP procedure are that the inherent complications of entering the peritoneal cavity, such as intra-abdominal organ injury or postoperative bowel obstruction secondary to adhesions or trocar site herniation, are avoided. However, the operative space is limited, and considerable experience is required to become familiar with the anatomy from this perspective.

Complications [43]

Since the hernia surgery is most frequently performed surgery now days the complication of this surgery outnumber the rest. Most of this complication is unpreventable. But some complication can be avoided by careful dissection..Thorough knowledge and understanding of this problem is essential, those who complaints high pain in the immediate post operative period go on to develop chronic pain later on. Thromboembolic complications are infrequent, with use of local anaesthesia and early mobilisation.

Some of the commonest complications are listed below:

1) Chronic pain
2) Ejaculatory pain

3) Numbness

Numbness is reported in 9% of patients undergoing open hernia repair

4) Ischaemic orchitis and testicular atrophy

The clinical feature starts with testicular pain, with signs of inflammation like fever and leuckocytosis. Its usually starts two days after the surgery. It usually spontaneously resolves in 60% of cases. In a few patient it persist resulting in testicular atrophy. This most dreaded complication occurs in 0.03 to 0.5% and 0.8 to 5% of patients after the repair of primary and recurrent hernias, respectively.

5) Wound Complications

- Haematoma

Post herniorrhaphy bleeding and hematoma usually seen with disruption of cremasteric artery, inferior epigastric vessels or cremasteric vessels. Injuries to the deep circumflex artery or the external iliac vessels may result in a large retroperitoneal haematoma.

Most haematomas are treated conservatively and would resolve spontaneously and only rarely is surgical intervention required.

- Seroma

Seromas occurs more commonly after mesh repair. It usually resolves by conservative management, if it is not responding then aspiration under aseptic precaution with antibiotic coverage is essential.

6) Infection

In generally nearly 5% of the patient develops post operative infection. Local treatment is directed at irrigating purulent material, lysing cellular, fibrous, and fibrinous debris, and destroying the infectious agent. Saline solution, granulated sugar, and topical antimicrobial substances are all useful. Complete incorporation can be expected with meshes of both polypropylene and polyester (but not with expanded polytetrafluoroethylene) in 3 to 4 weeks, providing the mesh firmly contacts tissue and is not floating free. Systemic antibiotics, of course, are essential.

On the other hand if an infection develops in the space containing Gore-Tex, the material has to be removed, because there is no chance that it will become incorporated before bacteria have inhabited the microscopic spaces in the material, as these spaces are too small to allow entrance of phagocytes and antimicrobial substances. Delayed infections involving the prosthesis occur, and the interval between prosthetic

implantation and infection may be months or years. In these cases and in all infected prosthetic wounds that have healed with a sinus, it is rarely possible for the prosthesis to become reintegrated, excision of the sequestered mesh is necessary. Only the sequestered mesh must be removed; the integrated mesh can remain. The use of prophylactic antibiotics is controversial.

7) Osteitis Pubis

It's an osteomyelitis of pubic as aresult of suturing and transfixation of mesh into periosteum. Now days its incidence decreased due to better surgical technique and avoidance of bite.

8) Prosthesis related complications

Tissue response, to foreign object is variable. It can cause contraction, erosion and trigger infection. When it erodes it can reach the abdominal cavity and cause fistula formation.

9) Complications Related to Laparoscopy

- ***Vascular Injury***

The most serious injuries occur to vessels that reside in the retroperitoneum. The risk for injury to vessels that requires operative intervention is 0.05%. The vessels most at risk are the distal aorta,

common iliac arteries and veins, and inferior vena cava. Injuries to the renal vessels have also been reported. These vessels are fixed and may be penetrated even if the safety mechanisms of the needle or trocar are working properly. The mesenteric and omental vessels are also at risk, especially in the presence of adhesions. The epigastric arteries may be injured with secondary cannula placement.

- ***Visceral Injury***

Visceral injuries are uncommon, occurring in 0.05% to 0.4% of all laparoscopic procedures, but they have a mortality rate of 5% 22. The most common means of injury is the insufflations needle. Injuries caused by the needle usually do not require repair. A lateral tear injury to the bowel, especially in the presence of a fixed adhesion, requires correction. Quite often, the injury goes unnoticed at the time of insult; so that visceral injury is the most common cause of late morbidity and mortality associated with laparoscopic access. Patients typically present with peritonitis and sepsis 2 days to 1 week after surgery. Visceral injury can be avoided by good surgical technique. The content should be thoroughly visualised and it should be completely reduced into abdomen before ligating and excising the sac.

Port-site hernias

This is a complication seen after the port placement. The wound created by placing port should be closed in layers otherwise hernia can occur from this site resulting in small bowel obstruction.

10) Recurrence

After the hernia surgery weakness in the fascia transversalis can occur resulting in recurrence. The recurrence largely depends upon the type of technique used, the profession of the patient, patient risk factor and surgeon skill.

Recurrence is more commonly seen in patients after surgery for bilateral direct hernia. This is most probably due to connective tissue weakness in these patients. The reason for indirect hernia to recur is lack of use of mesh, the dilated deep ring and in effective shutter mechanism. Persistence of proximal sac , insufficient mesh, or mesh erosion are other reason for recurrence.

STUDY DESIEGN AND METHODOLOGY

MATERIALS AND METHODS

SOURCE OF DATA: The study will be conducted on patients attending out-patient and inpatient of Mahatma Gandhi memorial general hospital Trichy which is attached to government KAPV medical college from 2015 January to march 2016.

INCLUSION CRITERIA

Patients with inguinal hernia irrespective of sex and occupation were included in the study

EXCLUSION CRITERIA

Patients with obvious risk factors like obstructive uropathy, intra abdominal malignancies.

Patient with age less than 16 years as exact position of pubic tubercle cannot be forecasted due to the growth of skeletal system.

Patient with congenital and acquired pelvic anomalies

Measurements: The study subjects were asked to lie in supine relaxed position on a hard bed. Keeping both their lower limbs straight, so that both the anterior superior iliac spine were at the same level. A line was drawn on the anterior abdominal wall. Connecting both anterior superior iliac spine which was given the name SS Line and the length of SS Line was noted; next the pubic tubercle on the side of hernia was marked by the palpation. Then vertical distance between this point and

the SS Line was measured in centimeters. This line was designated as ST line. The midpoint between the anterior superior iliac spine and the pubic symphysis was marked as the midinguinal point and the distance from it to the centre of the superficial inguinal ring was measured, the inguinal ligament length was measured as well. All these measurement thus obtained were tabulated and analyzed using Chi-square test and students ‘t' test. Similar measurement was done on control as well.

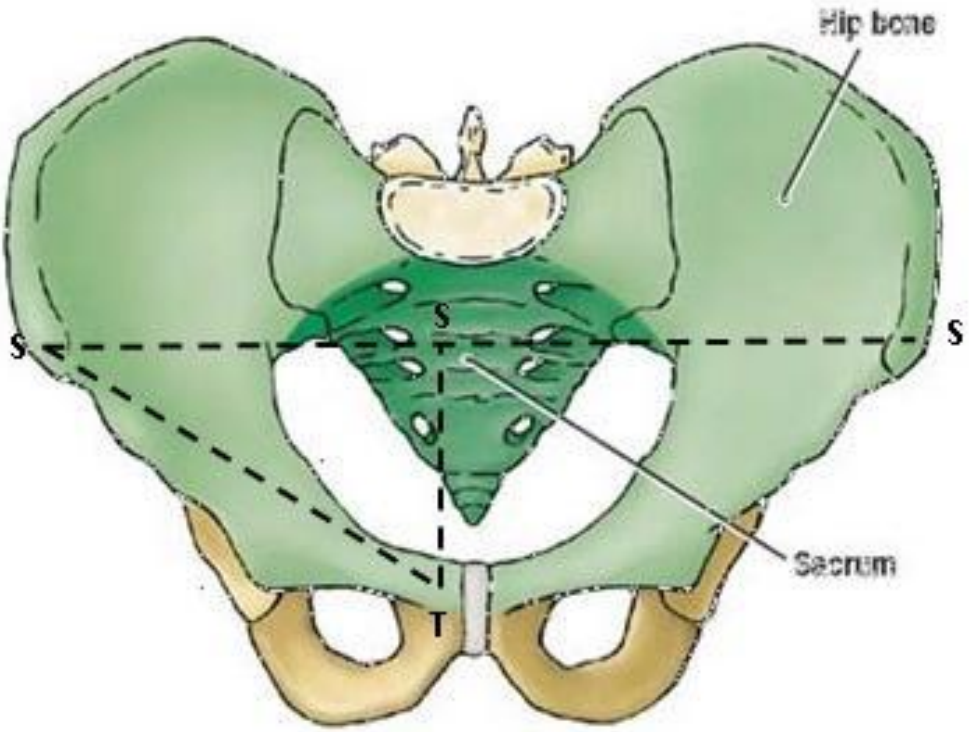


Fig 7. Graphic illustration for the measurement, SS, interspinal distance. ST, the pubic tubercle height

Data Analysis: The data collected was entered in to Microsoft office excel 2007. An attempt was made to find any relationship between ST Line and SS Line measurement and height, weight, built, occupation and age with side of hernia of the patient. The ST and SS Line measurements of the case were compared with those of controls to find out whether there is tendency of having low lying pubic tubercle in case of inguinal hernia. An attempt was also made to observe any correlation between ST segment and height, weight of the patients. The quantitative variables were summarized as mean and standard deviation while qualitative variables as percentage and proportion. To the statistical significance between the two independent two groups student‘t’ test while in more than two groups ANOVA (one way) was applied and to show correlation Pearson’s correlation was applied. The difference was considered significant when p value was less than 0.05.The statistical package used was SPSS 17

OBSERVATION AND DISCUSSION

OBSERVATION

The study was conducted at MGM General Hospital which is attached to KAPV Government medical college Tiruchirapalli. Total 150 patients who are admitted at my hospital are chosen based on prefixed criteria. The controls are selected from the out patient department which matches with patient with regard to age , sex and BMI.

AGE

The patient with age more than 16 years are choosen. The lowest age was 17 years and highest age was 83 years. The distribution of cases is shown in the table below, the highest incidence was noted in 50-60 age group with 28%. The lowest incidence 20-30 age group with 5.3%

GENDER

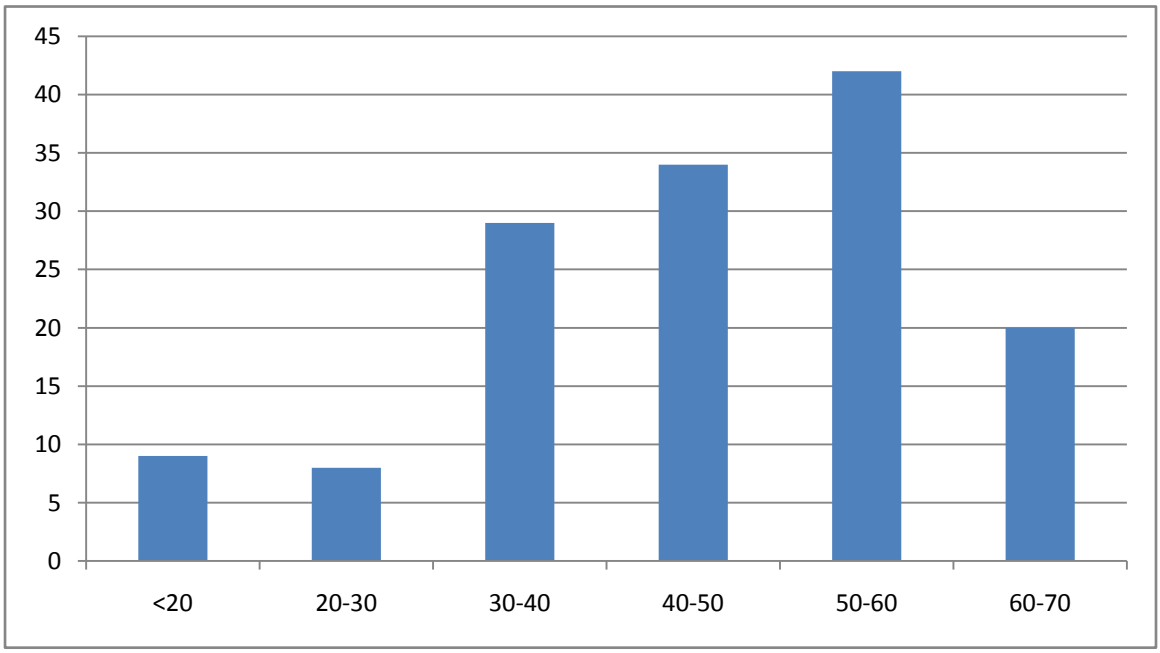


CHART 1: AGE WISE DISTRIBUTION OF CASE

The male show dominance among patient with incidence of 132 among 150, female form minority with rest 18 patients.

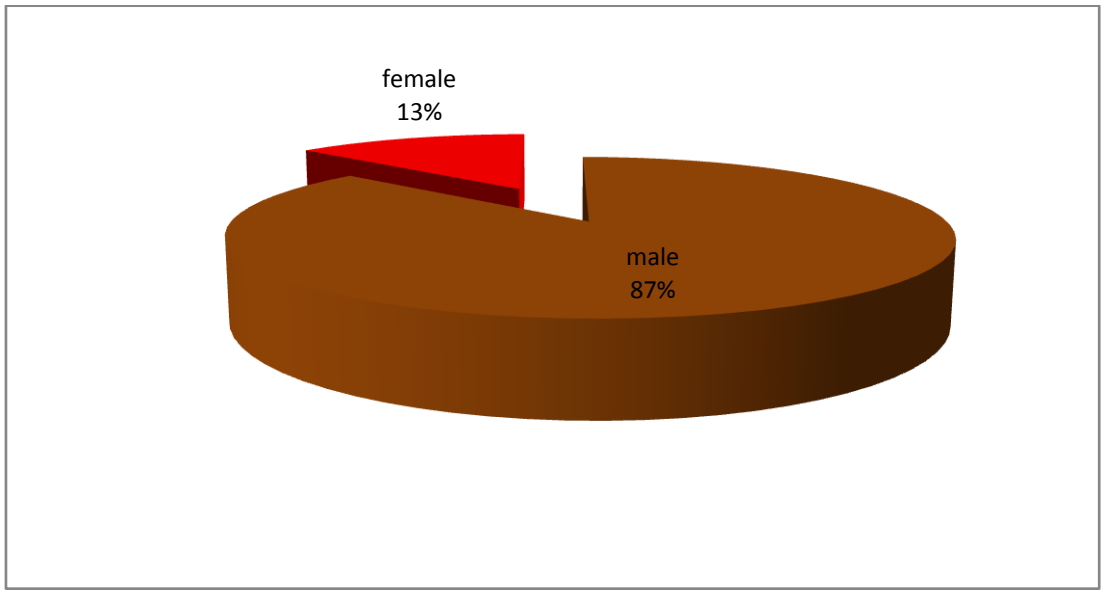


CHART 2: GENDER DISTRIBUTION OF CASES

BASED ON ANATOMY OF HERNIA

Based on the anatomy which was confirmed intraoperatively the hernia is divided into indirect, direct and pantaloon type with both components. Of this 150 hernia 19 hernia are bilateral , of bilateral type 12 has both component as direct and 7 both component indirect. In rest 40 patients have direct hernia and 86 have indirect hernia.5 patients had pantaloon type.

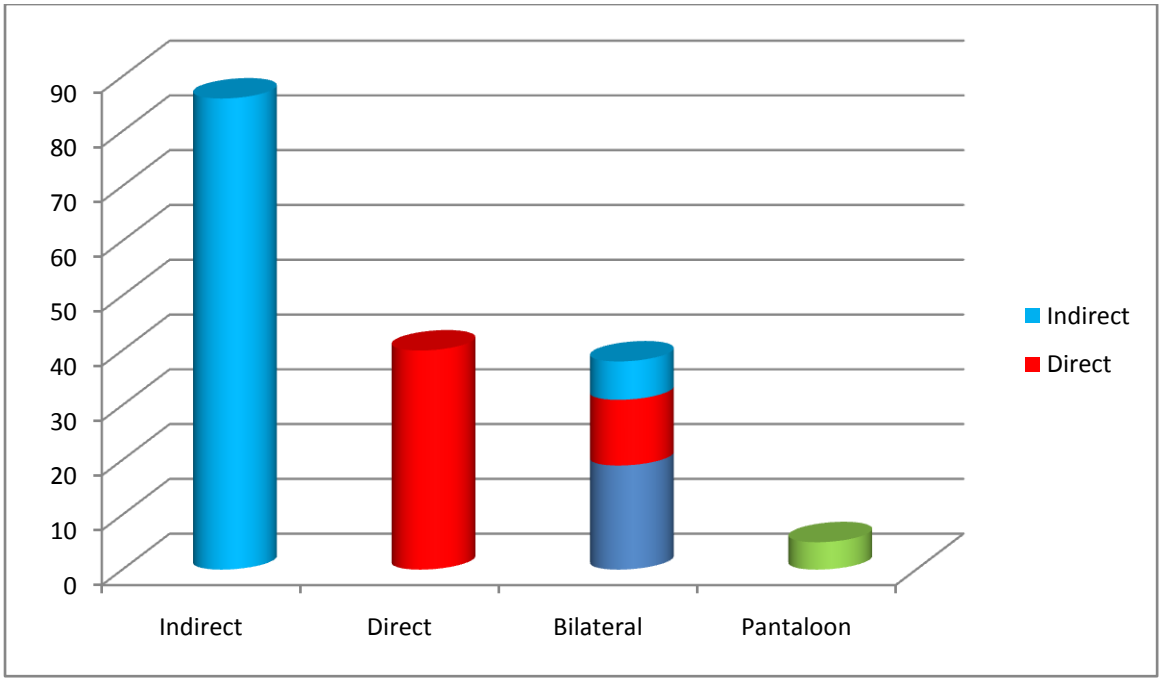


CHART 3: CLINICAL DISTRIBUTION OF CASES

Based on clinical presentation

The most common clinical presentation is painless swelling in the inguinal region which forms main complaint in 89 patients; pain is the second prominent complaint which forms 37 out of 150 patients. In rest 24 patients pain and swelling both were presenting complaint.

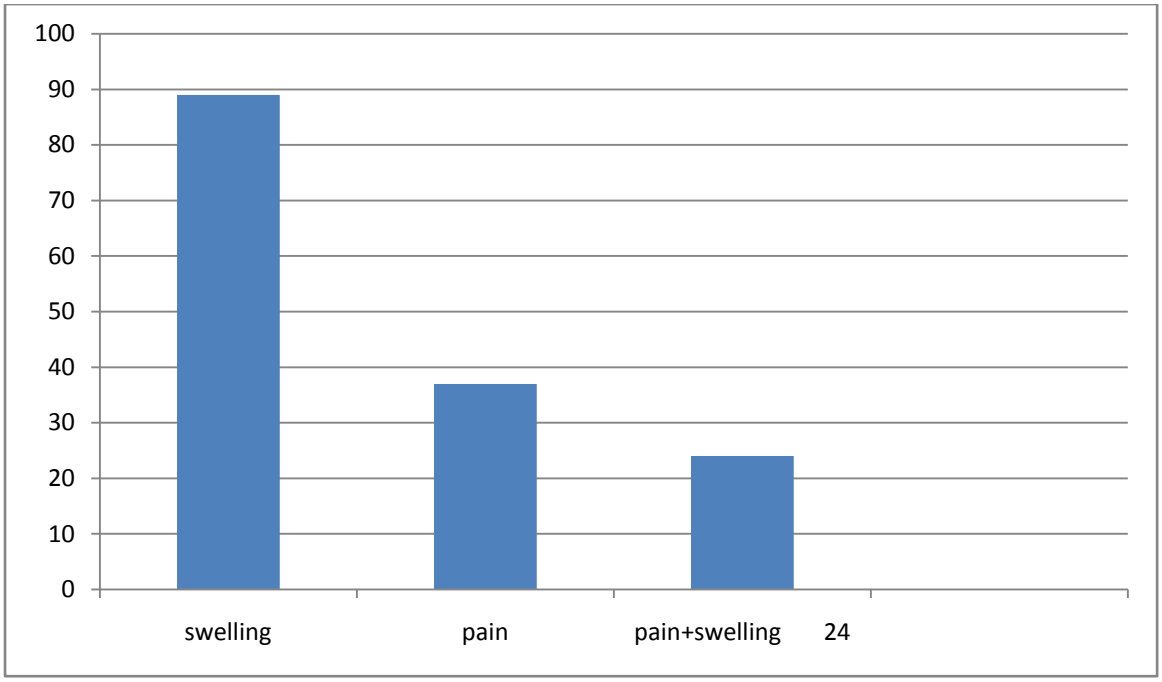


CHART 4: DISTRIBUTION BASED ON CLINICAL PRESENTATION

Based on complication

Complications which I came across in my studys were recurrence, obstruction, irreducibility and strangulation. Irreducibility was present in 27 patient, of this 27 patient 14 patient had features of obstruction like vomiting, constipation and abdominal distention. The features of strangulation present in 4 patient with severe pain, tenderness and redness in the skin over inguinal region. Recurrence was found in only 3 patients

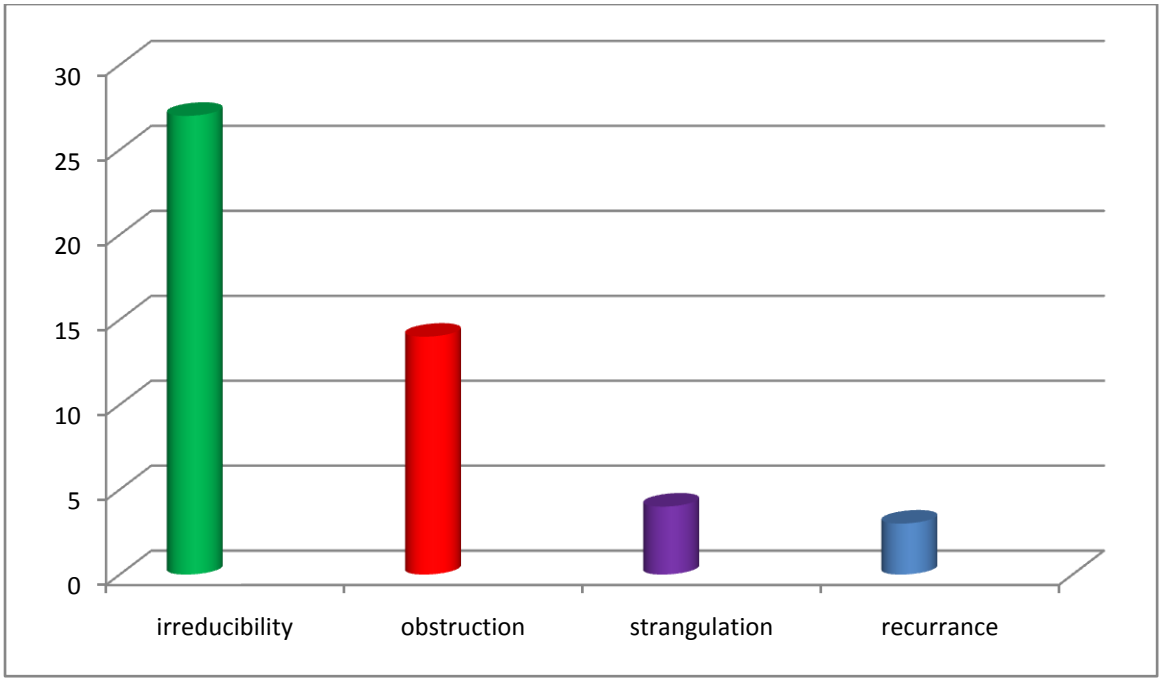


CHART 5: BASED ON COMPLICATION

Duration of disease

Of the 150 patients, 73 patients presented within one year, 37 patients between one and two year. 28 patient between 2nd and 3rd year . In rest the symptoms are present for more than 3 years.

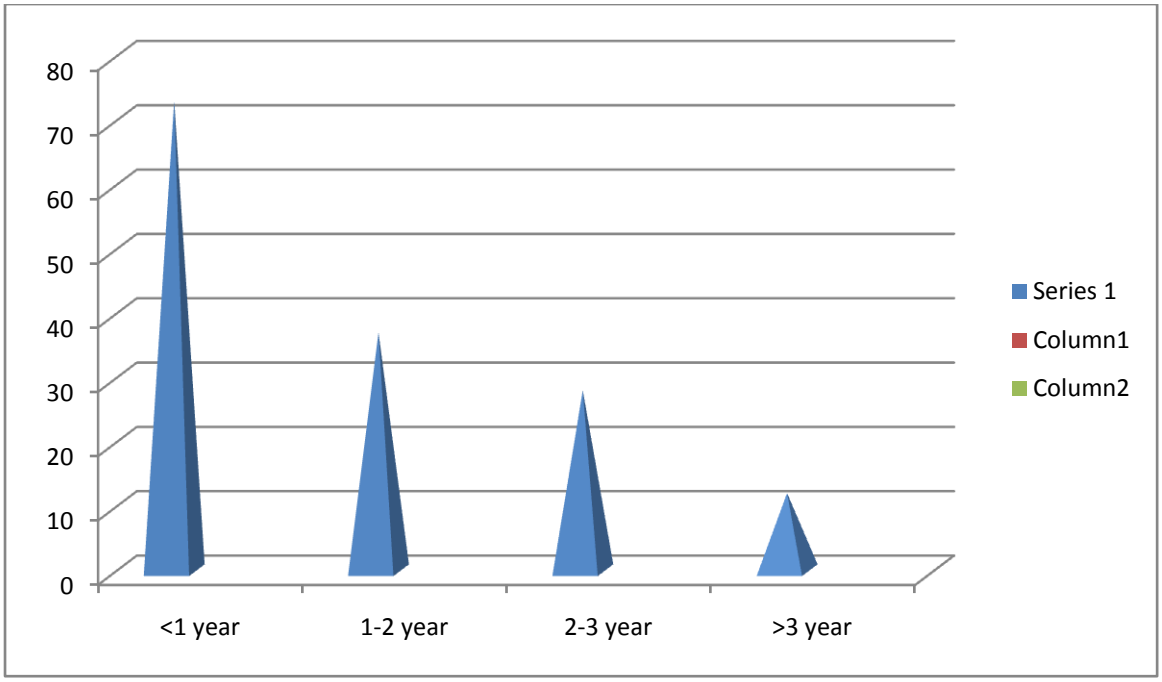


CHART 6: BASED ON DURATION OF DISEASE

Associated systemic disease

Most common systemic disease which was present in my patient was hypertension in 32 patients, followed by diabetic in 21 patients. Both diabetic and hypertension were present in 7 patients. The other diseases like cad, cva, ckd etc were present in 9 patients The patients with other chronic diseases like connective tissue disorder, copd, asthmatics, bph were excluded from the study.

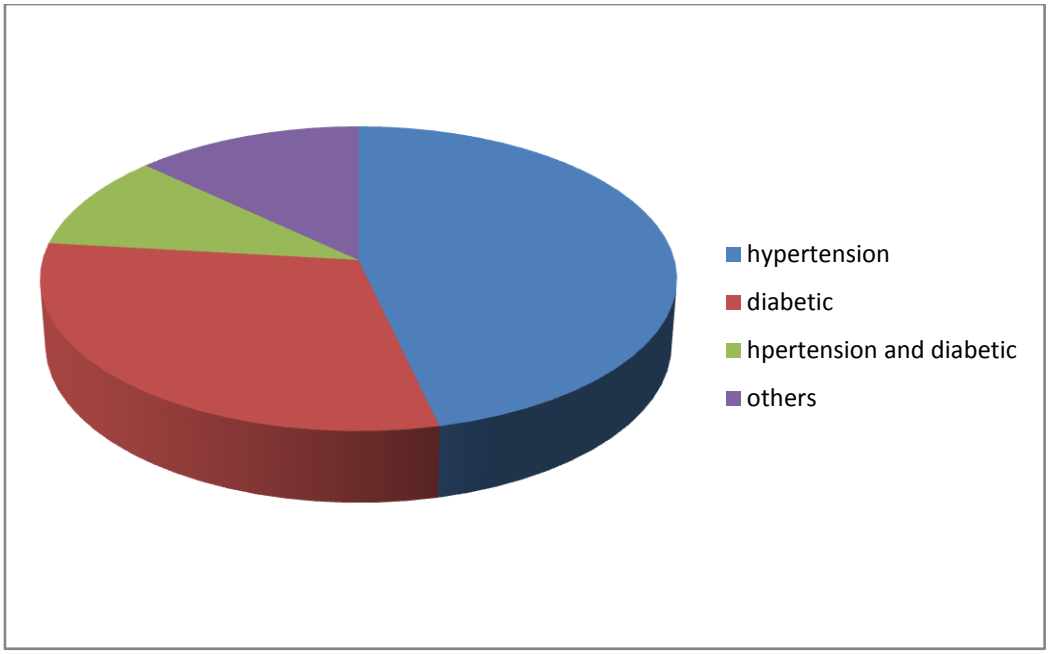


CHART 7: BASED ON ASSOCIATED SYSTEMIC DISEASE

BASED ON PARITY

Of the 18 females included in our study all of them were parous women.

BASED ON THE SITE OF LESION

Of the 150 patients 99 patient pathology was on right side and on 32 patients the hernia was on left side. In rest that is on 19 patients the lesion was bilateral.

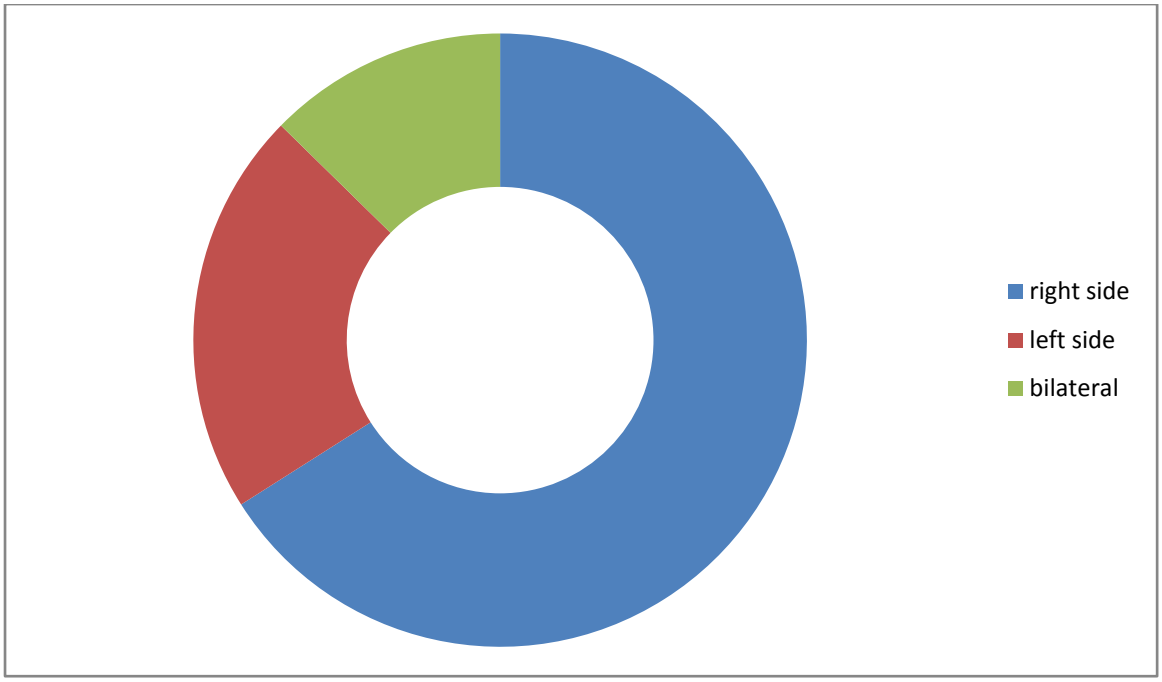


CHART 8: BASED ON SITE OF LESION

BASED ON BMI

Based on BMI the patient is divided into three class, first class is <18.5, second class between 18.5-24.99 and last class with BMI more than 25. The results I have shown in the graph below.

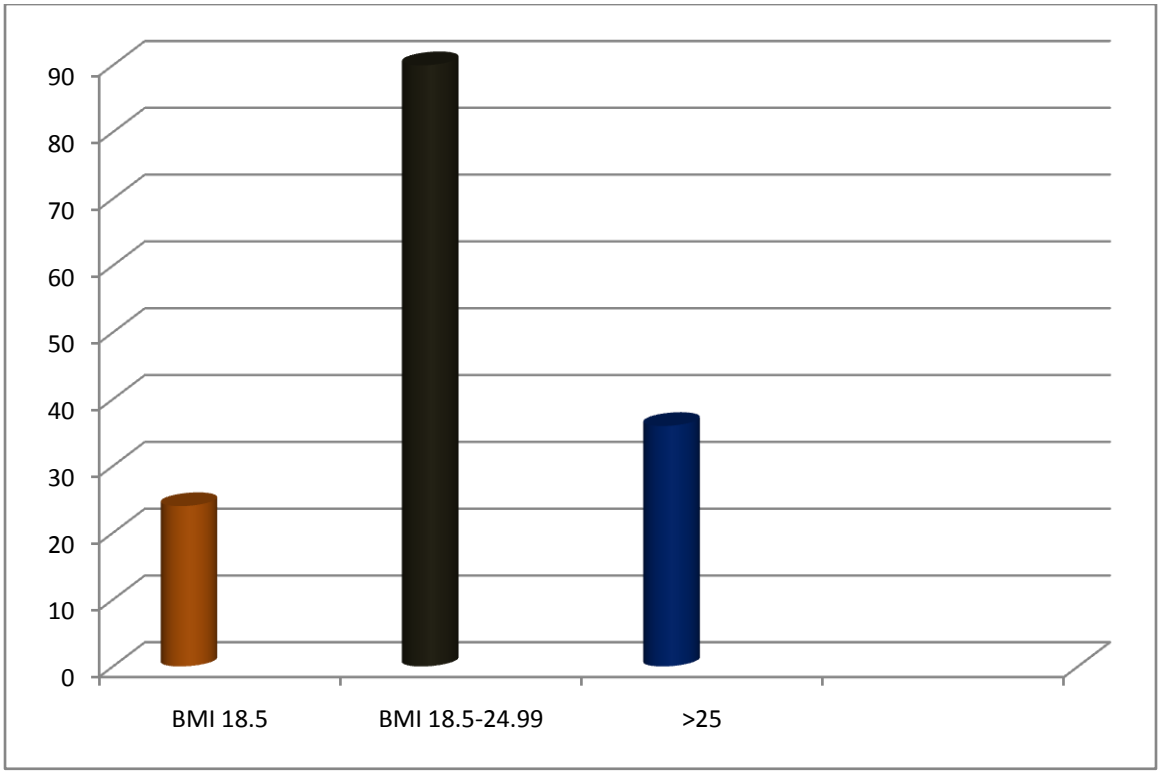


CHART 9: BASED ON BMI

RESULT

The following tables depict the various results

TABLE 1: COMPARING VALUES OF SS, ST AND MP WITH CONTROL

	n	Mean	S.D	t	df	Statistical inference
Age						
Study	150	47.59	14.604	.000	298	1.000>0.05 Not Significant
Control	150	47.59	14.604			
SS LINE						
Study	150	23.1243	.22787	9.786	298	.000<0.01 Significant
Control	150	22.8721	.21842			
ST LINE						
Study	150	7.3479	.18060	8.578	298	.000<0.01 Significant
Control	150	6.9304	.56811			
MP LINE						
Study	150	5.3275	.19817	-11.317	298	.000<0.01 Significant
Control	150	5.6315	.26262			

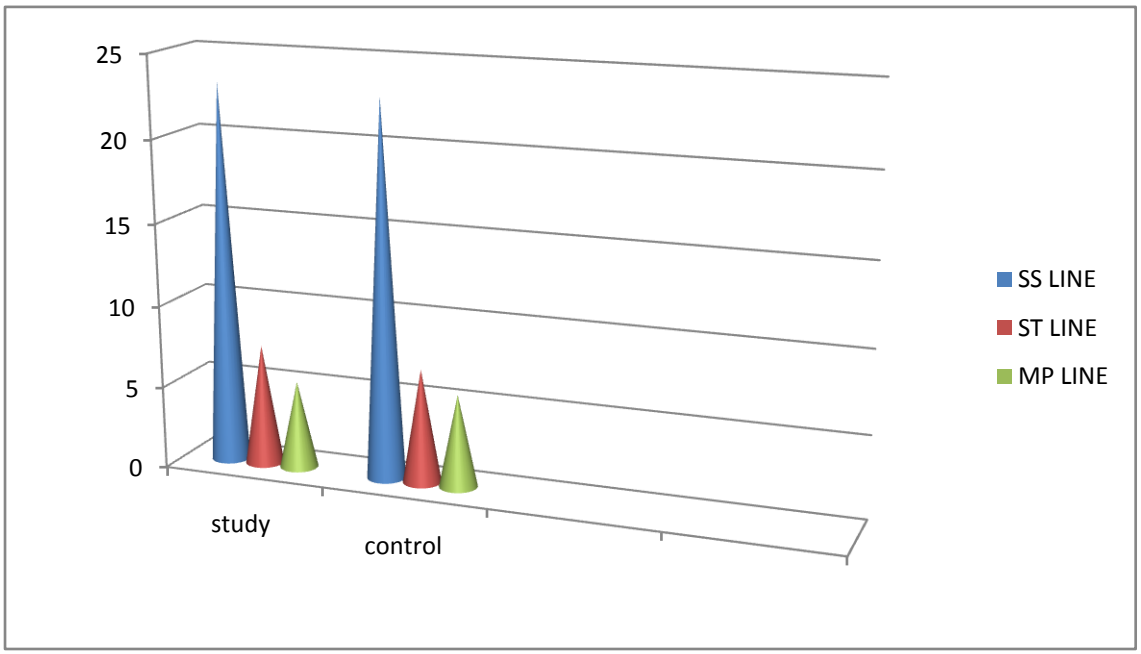


CHART 10: GRAPHICAL REPRESENTATION OF CASES AND CONTROL BY SS, ST AND MP VALUUES

In my study there was 150 cases and 150 controls. Among them the average SS value for case was 23.12 which was much above the average in control group which was 22.87. The t value was also significant (9.786). When it come to ST value the mean was 7.34 in the study group and mean was only 6.93 in the control group. The statistical significance was proved with t value 8.57. The average MP distance was 5.63 in control group which was much higher than study group with distance of 5.327.

TABLE 2: DISTRIBUTION OF CASES AND CONTROL BASED ON GENDER

Sex	Study		Control		Total		Statistical inference
	n	***%***	***n***	***%***	***n***	***%***	
Male	130	86.7%	130	86.7%	260	86.7%	X^2=.000 df=1 1.000>0.05 Not Significant
Female	20	13.3%	20	13.3%	40	13.3%	
Total	150	100.0%	150	100.0%	300	100.0%	

In my study the male cases were predominant with percentage of 86.7%, the females was only minority with 13.3% . The control was choosen with similar age and sex , hence chi square test was not significant.

TABLE 3: CLINICAL PROFILR OF CASES

Particulars	**No.of respondents (n=150)**	**Percentage (100%)**
Duration		
<1yr	73	48.7
1 to 2yrs	37	24.7
2 to 3yrs	28	18.7
>3yrs	12	8.0

Irreducible		
No	123	82.0
Yes	27	18.0
Obstructive Symptoms		
No	136	90.7
Yes	14	9.3
Strangulation Features		
No	146	97.3
Yes	4	2.7
Recurrence		
No	146	97.3
Yes	4	2.7
Hypertension		
YES	32	21.3
NO	118	78.7
Diabetes mellitus		
No	129	86.0
Yes	21	14.0
Any other chronic disease		
No	141	94.0
Yes	9	6.0
site of lesion		
RT	99	66.0
LT	32	21.3
Bilateral	19	12.7
BMI		

<18.5	24	16
18.5 to 24.99	90	60
>25	36	24

This table shows the clinical profile of the patient admitted with hernia in my hospital.

TABLE 4: COMPARING SS, ST AND MP VALUE IN CASES BASED ON DURATION OF DISEASE

	n	**Mean**	**S.D**	**SS**	**df**	**MS**	**Statistical inference**
SS LINE							
Between Groups				.260	3	.087	
<1yr	73	23.1349	.23878				f=1.694
1 to 2yrs	37	23.0657	.20355				.171>0.05
2 to 3yrs	28	23.1307	.21189				Not Significant
>3yrs	12	23.2258	.24637				
Within Groups				7.477	146	.051	
ST LINE							
Between Groups				.068	3	.023	
<1yr	73	7.3453	.16722				f=.694
1 to 2yrs	37	7.3703	.16843				.557>0.05
2 to 3yrs	28	7.3525	.22144				Not Significant

>3yrs	12	7.2842	.19838				
Within Groups				4.792	146	.033	
MP LINE							
Between Groups				.070	3	.023	
<1yr	73	5.3203	.19381				f=.591
1 to 2yrs	37	5.3262	.20173				.622>0.05
2 to 3yrs	28	5.3168	.20765				Not Significant
>3yrs	12	5.4000	.20172				
Within Groups				5.781	146	.040	

Following tables show the ST, SS and MP measurements of the patient based on various headings. There was not much significant difference as t test was negative , proving that this values cannot be implicated in the complication of hernia and this exclude measurement bias.

TABLE 5: COMPARING SS, ST AND MP VALUE IN IRREDUCIBLE CASES AND NORMAL CASES

Irreducible	**n**	**Mean**	**S.D**	**t**	**df**	**Statistical inference**
SS LINE						
No	123	23.1220	.22456	-.263	148	.793>0.05
Yes	27	23.1348	.24660			Not Significant
ST LINE						
No	123	7.3497	.18103	.251	148	.802>0.05
Yes	27	7.3400	.18185			Not Significant
MP LINE						
No	123	5.3263	.19615	-.159	148	.874>0.05
Yes	27	5.3330	.21093			Not Significant

TABLE 6: COMPARING SS, ST AND MP VALUE IN OBSTRUCTIVE CASES AND NORMAL CASES

Obstructive Symptoms	n	Mean	S.D	t	df	Statistical inference
SS LINE						
No	136	23.1195	.22772	-.811	148	.419>0.05
Yes	14	23.1714	.23237			Not Significant
ST LINE						
No	136	7.3481	.18027	.033	148	.974>0.05
Yes	14	7.3464	.19065			Not Significant
MP LINE						
No	136	5.3240	.19764	-.658	148	.512>0.05
Yes	14	5.3607	.20779			Not Significant

TABLE 7: COMPARING SS, ST AND MP VALUE IN STRANGULATED CASES AND NORMAL CASES

Strangulation Features	**n**	**Mean**	**S.D**	**t**	**df**	**Statistical inference**
SS LINE						
No	146	23.1260	.22687	.549	148	.584>0.05
Yes	4	23.0625	.29341			Not Significant
ST LINE						
No	146	7.3479	.18222	.005	148	.996>0.05
Yes	4	7.3475	.12285			Not Significant
MP LINE						
No	146	5.3271	.19970	-.128	148	.898>0.05
Yes	4	5.3400	.15078			Not Significant

TABLE 8: COMPARING SS, ST AND MP VALUE IN RECURRENT CASES AND NORMAL CASES

Recurrence	n	Mean	S.D	t	df	Statistical inference
SS LINE						
No	146	23.1205	.22791	-1.231	148	.220>0.05
Yes	4	23.2625	.20532			Not Significant
ST LINE						
No	146	7.3440	.17981	-1.632	148	.105>0.05
Yes	4	7.4925	.16919			Not Significant
MP LINE						
No	146	5.3292	.20027	.638	148	.525>0.05
Yes	4	5.2650	.08103			Not Significant

This table clearly shows that even though SS, ST line are much more that mean control value, it dosent significantly differ from cases. That it has no role in predicting complication.

DISCUSSION

DISCUSSION

The causation of inguinal hernia is varied with evolutionary, congenital, environmental, genetic factors, job and also the general state of health all contributing to its development. The low lying pubic tubercle predisposes to the development of inguinal hernia. Africans have a higher incidence of inguinal hernia as compared to Europeans since the Africans has comparatively more oblique pelvis(low lying pubic tubercle) than the Europeans. Sehgal et al (2000) in their study have classified the subjects as(Group I) “High lying pubic tubercle” i.e. those with ST line less than or equal to 7.5 cm and (Group II) “Low lying pubic tubercle” i.e. those with ST line more than 7.5 cm. They found out that in 73.6 % of cases and only 16% of controls belonged to Group II and concluded that the low lying pubic tubercle was a predisposing factor for inguinal hernia . The change in posture from pronograde to upright has caused reduction in efficiency of shutter mechanism of inguinal canal leading to the development of inguinal.

In the present study 74% of cases belonged to the Group II whereas 91.5% of controls belonged to Group I [Table 3]. The mean value of ST line in our study group is 7.8115+0.82526 which is significantly greater (p=0.001) than the controls the mean value being 6.5440+0.80056. Lopez- Cano et al (2005) have mentioned that the low pubic arch group showed a significantly longer inguinal ligament and a higher angle made

by the superior border of the suprainguinal space and inguinal ligament at its medial insertion. The lower the pubic tubercles anatomically located, the more often morphological variation are found in the external oblique, internal oblique, transversus, cremastric muscles and the fascia transversalis. Similar finding was observed by McVay CB et al (1971) and Novarro et al (1992) that European subjects having inguinal hernia have much low lying public tubercle as compared to the controls not having inguinal hernia. Feasibility of correlation between the measurements of ST line with weight and height was found out by calculating the values of correlation coefficients. A positive correlation was found between weight and ST line (r=0.0975) while (r=0.0384) between height and ST line. Similar finding has been revealed by a case control study by Ledinsky et al (1998), Ajmani ML et al (1983) and others.

The shutter-like mechanism at the internal inguinal ring is provided by contraction of the arching fibers of the internal oblique muscle, which, when shortened, approximate themselves to the inguinal ligament and compress the spermatic cord . The unusual origin and insertion of internal oblique and transverses abdominis muscle, results in an ineffective shutter mechanism of the inguinal canal .

This low lying pubic tubercle is very important before selecting the patient for any surgical correction. Its believe that higher the distance

between the inguinal ligament and musculoaponeurotic arch the classical inguinal hernia will not be feasible such patient should be chosen for hernioplasty . So the proper demonstration of anatomy of inguinal region is very important before selecting the surgical technique.

SUMMARY

SUMMARY

This case control study was done in Mahatma Gandhi Memorial Government Hospital, Trichy from the period of 2015 to 2016. A total of 150 patients suffering from inguinal hernia aged between 17 to 83 years were included in the study.

Patients having age less than 16 years are excluded from the study because their development of pelvis is not completed, and patient having congenital deformity to pelvis bone is excluded as measurement may give false values. The study was conducted in two groups' cases and control.

CASE GROUP: The patients suffering from inguinal hernia and admitted in study hospital

CONTROL GROUP: Patients attending opd with other complaints and not suffering from inguinal hernia.

The following measurements are taken

The interspinal distance

The tubospinal distance

The midinguinal point to pubic tubercle distance

In this study I found out that interspinal distance and pubospinal distance are more in cases compared to control. The midinguinal to pubic tubercle is more in controls. So I conclude that one of the etiology of the inguinal hernia can be attributed to anatomy of pubic tubercle and abnormal protective mechanism of internal oblique.

CONCLUSION

CONCLUSION

Based on my study I have made following conclusions

- The inguinal hernia was more common in 50-60 age group.
- The males are commonly affected than females.
- The right side inguinal hernia is predominant over left side.
- The indirect type predominate over direct type
- The most common complication seen is irreducibity.
- The most common systemic disease associated is hypertension.
- The most of my patient had BMI 18.5-24.99.
- The most common clinical presentation was swelling.\
- Most patients present within 1 year of disease onset.
- SS line, ST line were higher in cases.
- MP line was higher among the controls.

.

BIBLIOGRAPHY

1. Khan MA, Lo AY, Maele DM. Paraduodenal hernia. The American surgeon. 1998 Dec 1;64(12):1218.
2. Wechsler RJ, Kurtz AB, Needleman L, Dick BW, Feld RI, Hilpert PL, Blum L. Cross-sectional imaging of abdominal wall hernias. American Journal of Roentgenology. 1989 Sep 1;153(3):517-21.
3. Hansen NL, Ciritsis A, Otto J, Busch D, Kuhl CK, Kraemer NA. Utility of Magnetic Resonance Imaging to Monitor Surgical Meshes: Correlating Imaging and Clinical Outcome of Patients Undergoing Inguinal Hernia Repair. Investigative radiology. 2015 Jul 1;50(7):436-42..
4. López-Cano M, Munhequete EG, Hermosilla-Pérez E, Armengol-Carrasco M, Rodríguez-Baeza A. Anthropometric characteristics of the pubic arch and proper function of the defense mechanisms against hernia formation. Hernia. 2005 Mar 1;9(1):56-61.
5. Abdalla R, Mittelstaedt W. The importance of the size of Hessert's triangle in the etiology of inguinal hernia. Hernia. 2001 Sep 1;5(3):119-23.
6. Abrahamson J. Etiology and pathophysiology of primary and recurrent groin hernia formation. Surgical clinics of north America. 1998 Dec 1;78(6):953-72.

7. Banay GL. An introduction to medical terminology i. greek and latin derivations. Bulletin of the Medical Library Association. 1948 Jan;36(1):1.
8. Memon MA, Cooper NJ, Memon B, Memon MI, Abrams KR. Meta-analysis of randomized clinical trials comparing open and laparoscopic inguinal hernia repair. British Journal of Surgery. 2003 Dec 1;90(12):1479-92.
9. Rutkow IM. Epidemiologic, economic, and sociologic aspects of hernia surgery in the United States in the 1990s. Surgical clinics of north America. 1998 Dec 1;78(6):941-51.
10. Aguirre DA, Casola G, Sirlin C. Abdominal wall hernias: MDCT findings. American Journal of Roentgenology. 2004 Sep;183(3):681-90.
11. Ein SH, Njere I, Ein A. Six thousand three hundred sixty-one pediatric inguinal hernias: a 35-year review. Journal of pediatric surgery. 2006 May 31;41(5):980-6.
12. Walmsley R. The sheath of the rectus abdominis. Journal of anatomy. 1937 Apr;71(Pt 3):404.
13. Kalim M. *A randomised study to evaluate two different skin closure techniques: subcuticular sutures vs. staples: an*

investigation into patient satisfaction (Doctoral dissertation, Stellenbosch: Stellenbosch University).

14. Lytle WJ. Inguinal anatomy. Journal of anatomy. 1979 May;128(Pt 3):581.
15. Skandalakis JE, Gray SW, Skandalakis LJ, Colborn GL, Pemberton LB. Surgical anatomy of the inguinal area. World journal of surgery. 1989 Sep 1;13(5):490-8.
16. Ramasastry SS, Granick MS, Futrell JW. Clinical anatomy of the internal oblique muscle. Journal of reconstructive microsurgery. 1986 Jan;2(02):117-22.
17. Baez S. An open cremaster muscle preparation for the study of blood vessels by in vivo microscopy. Microvascular research. 1973 May 1;5(3):384-94.
18. Gray H. Anatomy of the human body. Lea & Febiger; 1918.
19. Moon HK, Taylor GI. The vascular anatomy of rectus abdominis musculocutaneous flaps based on the deep superior epigastric system. Plastic and reconstructive surgery. 1988 Nov 1;82(5): 815-29.
20. Ford A, Hutson J, Coventry BJ. Pediatric Abdominal Surgery. In Pediatric Surgery 2014 (pp. 25-118). Springer London.
21. Condon RE. Surgical anatomy of the transversus abdominis and transversalis fascia. Annals of surgery. 1971 Jan;173(1):1.

22. Atherton DS, Deep NL, Mendelsohn FO. Micro-anatomy of the renal sympathetic nervous system: a human postmortem histologic study. Clinical anatomy. 2012 Jul 1;25(5):628-33.

23. Al-dabbagh A. Anatomical variations of the inguinal nerves and risks of injury in 110 hernia repairs. Surgical and radiologic anatomy. 2002 Jan 1;24(2):102-7.

24. Casten DF. Functional anatomy of the groin area as related to the classification and treatment of groin hernias. The American Journal of Surgery. 1967 Dec 31;114(6):894-9.

25. Eckrich SG, Noble PC, Tullos HS. Effect of rotation on the radiographic appearance of the femoral canal. The Journal of arthroplasty. 1994 Aug 31;9(4):419-26.

26. Wolloscheck T, Konerding MA. Dimensions of the myopectineal orifice: a human cadaver study. Hernia. 2009 Dec 1;13(6):639-42.

27. Lynch SA, Renström PA. Groin injuries in sport. Sports Medicine. 1999 Aug 1;28(2):137-44.

28.. Miserez M, Alexandre JH, Campanelli G, Corcione F, Cuccurullo D, Pascual MH, Hoeferlin A, Kingsnorth AN, Mandala V, Palot JP, Schumpelick V. The European hernia society groin hernia classication: simple and easy to remember. Hernia. 2007 Apr 1;11(2):113-6.

29. Renzulli P, Frei E, Schafer M, Werlen S, Wegmuller H, Krahenbuhl L. Preoperative Nyhus Classification of Inguinal Hernias and Type-Related Individual Hernia Repair: A Case for Diagnostic Laparoscopy. Surgical Laparoscopy Endoscopy & Percutaneous Techniques. 1997 Oct 1;7(5):373-7.
30. Rutkow IM, Robbins AW. Classification systems and groin hernias. Surgical Clinics of North America. 1998 Dec 1;78(6):1117-27.
31. Miserez M, Alexandre JH, Campanelli G, Corcione F, Cuccurullo D, Pascual MH, Hoeferlin A, Kingsnorth AN, Mandala V, Palot JP, Schumpelick V. The European hernia society groin hernia classication: simple and easy to remember. Hernia. 2007 Apr 1;11(2):113-6.
32. Deeken CR, Faucher KM, Matthews BD. A review of the composition, characteristics, and effectiveness of barrier mesh prostheses utilized for laparoscopic ventral hernia repair. Surgical endoscopy. 2012 Feb 1;26(2):566-75.
33. Ekstrand J, Hilding J. The incidence and differential diagnosis of acute groin injuries in male soccer players. Scandinavian journal of medicine & science in sports. 1999 Apr 1;9(2):98-103.

34. Griffith CA. The Marcy repair of indirect inguinal hernia: 1870 to present. Hernia. 1989;3:106-18.

35. Read RC, McLeod PC. Influence of a relaxing incision on suture tension in Bassini's and McVay's repairs. Archives of Surgery. 1981 Apr 1;116(4):440-5.

36. Panos RG, Beck DE, Maresh JE, Harford FJ. Preliminary results of a prospective randomized study of Cooper's ligament versus Shouldice herniorrhaphy technique. Surgery, gynecology & obstetrics. 1992 Oct;175(4):315-9.

37. Memon MA, Cooper NJ, Memon B, Memon MI, Abrams KR. Meta-analysis of randomized clinical trials comparing open and laparoscopic inguinal hernia repair. British Journal of Surgery. 2003 Dec 1;90(12):1479-92.

38. Hay JM, Boudet MJ, Fingerhut A, Poucher J, Hennet H, Habib E, Veyrières M, Flamant Y. Shouldice inguinal hernia repair in the male adult: the gold standard? A multicenter controlled trial in 1578 patients. Annals of surgery. 1995 Dec;222(6):719.

39. Schmedt CG, Sauerland S, Bittner R. Comparison of endoscopic procedures vs Lichtenstein and other open mesh techniques for inguinal hernia repair: a meta-analysis of randomized controlled trials. Surgical Endoscopy And Other Interventional Techniques. 2005 Feb 1;19(2):188-99.

40. LeBlanc K. Complications associated with the plug-and-patch method of inguinal herniorrhaphy. Hernia. 2001 Sep 1;5(3):135-8.
41. Wantz GE. Giant prosthetic reinforcement of the visceral sac. Surgery, gynecology & obstetrics. 1989 Nov;169(5):408-17.
42. Panton ON, Panton RJ. Laparoscopic hernia repair. The American journal of surgery. 1994 May 31;167(5):535-7.
43. Stoppa R. [Complications in hernia surgery]. Journal de chirurgie.

ANNEXURES

PERFOMA

- Name: Occupation: DOA:
- Age: Address: DOD:
- Sex: IP NO:
- **Chief complaint and its duration:**
- a. swelling
- b. Pain
- c. Others
- **History of presenting illness**:
- a. Swelling
- i. Duration
- ii. Site
- iii. Mode of onset
- iv. Progress of the swelling
- v. history similar swelling in the past
- vi. Is swelling disappear on lying down
- b.Pain
- i. Duration
- ii. Onset
- iii. Site
- iv. Nature
- v. Radiation
- vi. Aggravating factors
- vii. Relievingfactors
- c. obstructive symptoms
- i. nausea

- ii .vomiting
- iii .constipation
-

d. Symptoms suggestive of strangulation

- i. sudden onset of severe pain
- ii. vomiting

e. Chest symptoms

- i. history of chronic cough
- ii. Hemoptysis
- iii. breathing difficulty

f. Urinary symptoms

- i. difficulty to pass urine
- ii. frequency and urgency of micturition

g. bowel symptomS

- Past history
- Previous history of inguinal hernia
- History of any abdominal surgeries like appendicectomy

Past history of tb, stricture urethra, bph, constipation

- **Family history**
- i. h/o tb in family members
- **Personal history**
- i. Diet
- ii. Sleep
- iii. bowel and bladder habbit
- **Treatment history**
- history of any drug intake
- use of trus

- iii. **GENERAL EXAMINATION**

Pallor: Icterus:

- L ymph adenopathy Cyanosis: Clubbing:
- Built:thin/moderate/obese :
-
- Vitals: i. Pulse rate
- ii. Respiratory rate:
- iii. BP
- iv. Temperature:
- **LOCAL EXAMINATION**
- 1.Inspection
- Swelling –
- site
- shape:
- Size:
- extent
- surface
- skin over the swelling
- peristasis
- postion of penis
- is reducible on lying down
- any other swellings-lymph nodes
- 2.Palpation:
- Local raise of temperature
- tenderness
- shape

- site
- size
- extent
- surface
- consistency
- impulse on coughing
- relation to testis and spermatic cord
- reducible or not
- zeimanns test
- deep ring occlusion test
- invagination test
- regional lymph nodes
- 3.**Percussion:**
-
- 4.**Auscultation:**
- Bowel sound

- **Tone of abdominal muscle**

- **SYSTEMIC EXAMINATION**
- i.CVS:
- ii. RS :
- iii. ABDOMEN
- iv.CNS :

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு

16 வயதிற்கு மேற்பட்டவர்களின் குடல் இறக்கம் பற்றிய பிரச்சனைகளை ஆராய்தல்

ஆராய்ச்சி நிலையம் : மகாத்மா காந்தி நினைவு அரசு மருத்துவமனை, மற்றும் கி.ஆ.பெ.விசுவநாதம் அரசு மருத்துவ கல்லூரி, திருச்சி.

பங்கு பெறும் நோயாளியின் பெயர் : வயது:

பாலினம் : ஆண் ☐ பெண் ☐

பங்கு பெறும் நோயாளியின் எண் :

நோயாளியின் பெயர் / விலாசம் :

நோயாளி இதனை ( ) குறிக்கவும் :

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது என்னுடைய சந்தேகங்களை கேட்கவும் அதற்கான தகுந்த விளக்கங்களைப் பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் இவ்வாய்வில் தன்னிச்சையாகத்தான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் என்னை இவ்வாய்வில் இருந்து விலக்கிக் கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளைப் பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் விலக்கிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும் பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக்கொள்ளவும் அதை பரிசோதிக்க என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் என்னை ஈடுபடுத்த முழுமனதுடன் ஒப்புக் கொள்கிறேன். இந்த அறுவை சிகிச்சை மற்றும் அதனால் ஏற்படக்கூடிய பின் விளைவுகள் மற்றும் எதிர்பாராத விளைவுகள் பற்றி எனக்கு விளக்கமாகத் தெரிவிக்கப்பட்டது. ☐

என் நலன் கருதியே இந்த ஆய்வு மேற்கொள்ளப்பட்டது என்று தெரிந்து இந்த ஆய்விற்கு ஒப்பளிக்கின்றேன். ☐

நோயாளியின் கையொப்பம் .....இடம் ..... தேதி.....

கட்டை விரல் ரேகை (இந்த படிவம் படித்து காட்டப்பட்டு புரிந்து கைரேகை அளிக்கின்றேன்)

ஆய்வாளரின் கையொப்பம் ..... இடம் ..... தேதி.....

ஆய்வாளரின் பெயர் .....

நோயாளி தகவல் தாள்

ஆய்வு செய்யப்படும் தலைப்பு

16 வயதிற்கு மேற்பட்டவர்களின் குடல் இறக்கம் பற்றிய பிரச்சனைகளை ஆராய்தல்

ஆராய்ச்சியின் நோக்கமும் ஆதாயங்களும்

இந்த ஆராய்ச்சியில் 16 வயதிற்கு மேற்பட்ட குடலிறக்கத்துடன் வரும் நோயாளிகளை பரிசோதனை செய்து அவருக்கு கதிர்வீச்சு பரிசோதனை செய்து இடுப்பு எலும்பிற்கும் புயூபிக் டியூபர்கிளுக்கும் உள்ள இடைவெளியை அளந்து அது அதிகமாக இருக்குமாயின் அவருக்கு குடல் இறக்கம் ஏற்பட வாய்ப்பு மற்றவர்களை விட அதிகம் என்பதை பற்றி அறிவதற்கே இந்த ஆராய்ச்சி மேற்கொள்ளப்படுகிறது.

MASTER CHART CASE

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	**543**	**34**	**M**	**1**	**2**	**1**	**1**	**1**	1	**2**	**1**	**1**	**1**	**2**	**23.12**	**7.54**	5.54
2	**1234**	**43**	**M**	**2**	**1**	**1**	**1**	**1**	1	**2**	**1**	**1**	**1**	**2**	**23.47**	**7.6**	**5.19**
3	**2134**	**29**	**M**	**2**	**2**	**1**	**1**	**1**	1	**2**	**1**	**1**	**1**	**2**	**23.23**	**7.34**	**5.2**
4	**31321**	**61**	**M**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.87**	**7.6**	**5.62**
5	**23416**	**59**	**M**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**22.83**	**7.03**	**5.66**
6	**25417**	**47**	**M**	**2**	**4**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**22.97**	**7.57**	**5.68**
7	**34216**	**33**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.96**	**7.15**	**5.53**
8	**26189**	**56**	**M**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**2**	**22.99**	**7.49**	**5.68**
9	**32468**	**46**	**M**	**1**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.25**	**7.22**	**5.66**
10	**39842**	**52**	**F**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.23**	**7.34**	**5.21**
11	**25981**	**47**	**M**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**2**	**23.26**	**7.6**	**5.23**
12	**21768**	**53**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**23.27**	**7.08**	**5.22**
13	**45321**	**21**	**M**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**23.34**	**7.59**	**5.32**

14	**24512**	**54**	**M**	**3**	**4**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.8**	**7.17**	**5.32**
15	**37621**	**48**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.76**	**7.45**	**5.36**
16	**21721**	**62**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**22.99**	**7.23**	**5.33**
17	**28541**	**34**	**M**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**22.98**	**7.38**	**5.37**
18	**21861**	**57**	**M**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**23.33**	**7.66**	**5.27**
19	**21765**	**49**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**23.32**	**7.32**	**5.29**
20	**21756**	**35**	**M**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.82**	**7.52**	**5.22**
21	**21821**	**72**	**M**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**1**	**2**	**23.54**	**7.34**	**5.11**
22	**29641**	**42**	**M**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.96**	**7.23**	**5.12**
23	**28712**	**68**	**M**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.49**	**7.48**	**5.05**
24	**17812**	**56**	**M**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.23**	**7.56**	**5.06**
25	**29987**	**59**	**F**	**2**	**4**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**23.35**	**7.24**	**5.28**
26	**26781**	**43**	**M**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.07**	**7.42**	**5.43**
27	**29732**	**31**	**M**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**3**	**22.89**	**7.3**	**5.15**
28	**23897**	**19**	**M**	**2**	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.12**	**7.01**	**5.37**
29	**25919**	**57**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**23.24**	**7.52**	**5.39**

30	**26519**	**71**	**M**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**22.96**	**7.18**	**5.42**
31	**24462**	**44**	**M**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**22.8**	**7.56**	**5.24**
32	**25091**	**67**	**M**	**1**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**23.13**	**7.24**	**5.16**
33	**25931**	**58**	**F**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.05**	**7.43**	**5.47**
34	**25001**	**62**	**M**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.87**	**7.07**	**5.33**
35	**25498**	**44**	**M**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.19**	**7.55**	**5.05**
36	**25005**	**31**	**M**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.12**	**7.52**	**5.27**
37	**27341**	**68**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**22.91**	**7.24**	**5.27**
38	**29538**	**51**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.98**	**7.24**	**5.3**
39	**28832**	**41**	**M**	**2**	**4**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**22.97**	**7.56**	**5.5**
40	**27701**	**31**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.88**	**7.18**	**5.3**
41	**26632**	**63**	**M**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**22.86**	**7.33**	**5.23**
42	**32761**	**58**	**F**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.87**	**7.45**	**5.27**
43	**33891**	**43**	**M**	**1**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**22.91**	**7.57**	**5.47**
44	**34009**	**64**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**22.9**	**7.29**	**5.37**
45	**33871**	**18**	**M**	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**23.35**	**7.48**	**5.68**

46	32871	61	F	2	3	1	1	1	1	1	1	1	2	2	23.35	7.56	5.08
47	39818	32	M	1	1	1	1	1	1	2	1	1	1	2	23.36	7.12	5.07
48	32176	33	M	2	4	1	1	1	1	2	1	1	1	2	23.5	7.04	5.18
49	31131	57	M	3	1	1	1	1	1	2	1	1	2	2	23.05	7.25	5.28
50	32513	51	M	2	2	2	2	2	1	1	1	2	3	2	22.76	7.49	5.27
51	33651	46	M	1	2	1	1	1	1	2	1	1	1	2	22.86	7.32	5.29
52	33981	64	M	3	1	1	1	1	1	1	1	1	1	2	22.88	7.54	5.19
53	34897	18	M	2	1	1	1	1	1	2	1	1	1	2	22.98	7.26	5.11
54	36712	37	M	2	3	1	1	1	1	2	2	1	2	2	22.96	7.58	5.08
55	33001	59	M	1	1	2	1	1	1	2	1	1	1	2	22.84	7.43	5.07
56	33091	45	M	1	1	1	1	1	1	1	1	1	1	2	22.92	7.05	5.08
57	33451	69	M	2	1	1	1	1	1	1	1	1	2	2	22.97	7.17	5.76
58	33871	54	F	2	3	1	1	1	1	2	1	1	3	2	22.95	7.59	5.76
59	33009	38	M	2	1	1	1	1	1	2	1	1	1	2	23.34	7.38	5.66
60	33761	65	M	1	1	2	1	1	1	2	1	1	1	2	23.45	7.46	5.72
61	33761	56	M	2	1	1	1	1	1	2	1	1	2	1	23.47	7.24	5.55

62	33063	47	F	2	4	1	1	1	1	1	2	1	1	2	23.38	7.02	5.57
63	35118	67	M	1	1	1	1	1	1	2	1	1	3	2	23.27	7.39	5.53
64	30012	39	M	2	1	1	1	1	1	2	1	1	1	2	23.47	7.17	5.23
65	37123	23	M	2	2	2	2	1	1	2	2	1	1	2	23.27	7.12	5.26
66	35132	49	M	1	3	1	1	1	1	2	1	1	1	2	23.33	7.02	5.09
67	36712	66	M	2	1	1	1	1	1	1	1	1	2	2	22.92	7.34	5.29
68	39023	73	F	2	1	1	1	1	1	1	1	1	1	2	23.48	7.16	5.11
69	32881	62	M	1	4	2	1	1	1	2	1	1	1	2	23.49	7.08	5.17
70	33671	22	M	2	1	1	1	1	1	2	1	1	1	3	22.98	7.6	5.28
71	34099	53	M	2	2	1	1	1	1	2	2	1	1	2	23.07	7.45	5.78
72	31651	41	M	1	3	2	1	1	1	1	1	1	2	2	23.05	7.57	5.68
73	32781	36	F	2	1	1	1	1	1	2	1	1	1	2	23.15	7.19	5.77
74	33087	18	M	2	2	1	1	1	1	2	1	1	1	2	23.35	7.38	5.18
75	32165	59	M	1	4	1	1	1	1	2	1	1	3	2	23.3	7.26	5.68
76	35431	46	F	2	1	2	2	1	1	2	2	1	2	2	23.23	7.64	5.54
77	39812	51	M	2	1	1	1	1	1	2	1	1	1	2	22.96	7.12	5.23

78	**37612**	**37**	**M**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**22.97**	**7.49**	**5.33**
79	**39562**	**76**	**M**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**22.98**	**7.57**	**5.37**
80	**40098**	**44**	**M**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**23.19**	**7.35**	**5.38**
81	**42176**	**62**	**M**	**1**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.2**	**7.53**	**5.07**
82	**41743**	**33**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**23.3**	**7.12**	**5.09**
83	**43137**	**83**	**M**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**23.12**	**7.59**	**5.11**
84	**48712**	**54**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.34**	**7.39**	**5.19**
85	**45621**	**17**	**M**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.96**	**7.46**	**5.42**
86	**48712**	**69**	**M**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**3**	**2**	**23.4**	**7.24**	**5.24**
87	**49761**	**31**	**M**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**3**	**23.13**	**7.02**	**5.16**
88	**46712**	**47**	**M**	**2**	**4**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.05**	**7.39**	**5.58**
89	**44328**	**32**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.87**	**7.27**	5.33
90	**42671**	**51**	**M**	1	**2**	**1**	**1**	**1**	**1**	**2**	**2**	2	**1**	**2**	**23.19**	**7.15**	5.05
91	**46321**	**33**	**M**	**2**	3	2	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.82**	**7.17**	5.27
92	**48712**	**44**	**M**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.04**	**7.05**	5.19
93	**48433**	**46**	F	**2**	2	**1**	**1**	**1**	**1**	1	**1**	**1**	**1**	**1**	**23.36**	**7.43**	5.52

94	**46599**	**57**	**M**	1	2	**1**	**1**	**1**	**1**	1	**1**	2	**3**	**2**	**23.28**	**7.58**	5.34
95	**47234**	**35**	**M**	3	3	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.43**	**7.26**	5.16
96	**49992**	**47**	**M**	**2**	2	2	2.0	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.05**	**7.46**	5.48
97	**48953**	**26**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.87**	**7.32**	5.23
98	**48762**	**66**	**M**	**2**	2	**1**	**1**	**1**	**1**	1	**1**	**1**	**2**	**2**	**22.89**	**7.12**	5.05
99	**46312**	**48**	**M**	1	3	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**23.44**	**7.03**	5.57
100	**47651**	**34**	F	**2**	4	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.42**	**7.26**	5.19
101	**49511**	**36**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.93**	**7.56**	5.23
102	**48912**	**18**	**M**	**2**	1	2	2.0	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.48**	**7.17**	5.05
103	**49022**	**47**	**M**	1	2	**1**	**1**	**1**	**1**	1	**2**	**1**	**1**	**2**	**22.87**	7,48	5.57
104	**43217**	**37**	**M**	**2**	3	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.21**	**7.29**	5.19
105	**48769**	**53**	F	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	2	**2**	**2**	**23.32**	**7.3**	5.42
106	**48651**	**46**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**3**	**23.05**	**7.01**	5.26
107	**49098**	**34**	**M**	1	2	2	2.0	2	**1**	**2**	**1**	**1**	**3**	**2**	**22.89**	**7.36**	5.18
108	**49539**	**22**	**M**	1	3	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.08**	**7.55**	5.5
109	**49812**	**43**	F	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.27**	**7.17**	5.33

110	**49532**	**39**	**M**	**2**	2	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.28**	**7.49**	5.15
111	**46531**	**55**	**M**	3	4	2	**1**	**1**	**1**	1	**1**	**1**	**2**	**2**	**23.02**	**7.26**	5.47
112	**47932**	**17**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.11**	**7.35**	5.06
113	**46991**	**38**	F	**2**	3	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**23.5**	**7.42**	5.32
114	**48441**	**59**	**M**	1	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**22.84**	**7.29**	5.16
115	**49684**	**49**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.23**	**7.56**	5.42
116	**49482**	**19**	**M**	1	1	2	2.0	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.21**	**7.16**	5.1
117	**48441**	**51**	**M**	**2**	2	**1**	**1**	**1**	**1**	1	**2**	2	**2**	**2**	**22.9**	**7.46**	5.12
118	**49441**	**46**	**M**	1	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**1**	**22.84**	**7.32**	5.13
119	**48006**	**54**	**M**	**2**	3	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.91**	**7.03**	5.16
120	**42138**	**59**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.31**	**7.45**	5.26
121	**40043**	**34**	F	**2**	2	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.33**	**7.18**	5.07
122	**48651**	**51**	**M**	**2**	1	2	**1**	**1**	**1**	**2**	**2**	**1**	**2**	**2**	**22.84**	**7.59**	5.28
123	**49871**	**43**	**M**	1	3	**1**	**1**	**1**	**1**	1	**1**	**1**	**3**	**2**	**22.9**	**7.38**	5.33
124	**47671**	**78**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.1**	**7.6**	5.37
125	**48712**	**24**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.11**	**7.4**	5.32

126	**44321**	**76**	**M**	**2**	2	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.21**	**7.52**	5.51
127	**48761**	**51**	**M**	1	1	2	2.0	2	**1**	1	**2**	2	**2**	**2**	**23.41**	**7.19**	5.53
128	**48871**	**68**	F	**2**	3	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.31**	**7.6**	5.17
129	**46613**	**35**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.41**	**7.33**	5.18
130	**47013**	**52**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**3**	**23.42**	**7.45**	5.27
131	**51761**	**44**	**M**	1	2	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**3**	**2**	**23.5**	**7.18**	5.42
132	**52981**	**59**	**M**	**2**	3	2	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.44**	**7.19**	5.36
133	**50673**	**55**	**M**	**2**	4	**1**	**1**	**1**	2	1	**1**	**1**	**1**	**2**	**23.46**	**7.56**	5.18
134	**50498**	**36**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.82**	**7.32**	5.23
135	**43871**	**58**	**M**	1	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**22.83**	**7.6**	5.5
136	**44987**	**71**	**M**	**2**	1	2	2.0	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**22.91**	**7.59**	5.42
137	**53298**	**47**	F	**2**	2	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.84**	**7.17**	5.79
138	**51873**	**57**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.86**	**7.6**	5.71
139	**50658**	**56**	**M**	1	2	**1**	**1**	**1**	**1**	1	**2**	2	**3**	**2**	**23.14**	**7.33**	5.52
140	**51871**	**37**	**M**	**2**	3	2	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.86**	**7.08**	5.03
141	**52871**	**56**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23**	**7.46**	5.02

142	**53091**	**43**	**M**	**2**	2	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.88**	**7.44**	5.37
143	**53287**	**29**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**23.4**	**7.58**	5.28
144	**52176**	**38**	**F**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.3**	**7.32**	5.18
145	**54091**	**61**	**M**	1	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**23.31**	**7.14**	5.56
146	**54981**	**54**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**22.81**	**7.46**	5.67
147	**54761**	**46**	**M**	**2**	1	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**22.62**	**7.25**	5.37
148	**55043**	**51**	F	**2**	2	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**22.82**	**7.18**	5.26
1149	**52312**	**61**	M	**2**	1	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**23.16**	**7.55**	5.72
150	**55981**	**55**	M	1	2	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**23.33**	**7.16**	5.37

MASTER CHART CONTROL

A	B	C	D	P	Q	R
1	34	M	2	22.9	7.21	5.82
2	43	M	2	23.1	6.99	5.78
3	29	M	2	23.12	0.56	5.67
4	61	M	2	22.81	6.72	5.98
5	59	M	2	22.65	6.96	5.76
6	47	M	1	22.98	6.82	5.61
7	33	M	2	22.68	6.76	5.91
8	56	M	2	22.6	6.82	5.86
9	46	M	2	22.95	6.9	5.9
10	52	F	2	22.87	6.85	5.93
11	47	M	2	23	7.42	5.91
12	53	M	2	22.56	6.94	6.02
13	21	M	2	22.76	7.32	5.87
14	54	M	2	22.9	7.12	5.84
15	48	M	2	23.13	6.93	5.86
16	62	M	2	23.5	6.86	5.91
17	34	M	2	22.56	7.12	6.02
18	57	M	2	22.84	7.43	5.9
19	49	M	1	22.67	6.9	5.34
20	35	M	2	23.11	6.95	5.44
21	72	M	2	22.87	6.94	5.97
22	42	M	2	22.68	6.87	5.65
23	68	M	2	22.49	7.23	5.5
24	56	M	2	22.68	6.91	5.54

25	**59**	**F**	**2**	**23.03**	**6.63**	**5.62**
26	**43**	**M**	**2**	**22.98**	**7.42**	**5.23**
27	**31**	**M**	**3**	**22.78**	**6.87**	**5.67**
28	**19**	**M**	**2**	**22.56**	**6.98**	**5.62**
29	**57**	**M**	**2**	**22.85**	**6.78**	**5.99**
30	**71**	**M**	**2**	**22.99**	**7.18**	**5.64**
31	**44**	**M**	**1**	**22.65**	**7.19**	**5.74**
32	**67**	**M**	**2**	**22.87**	**7.21**	**5.92**
33	**58**	**F**	**2**	**22.65**	**7.43**	**5.21**
34	**62**	**M**	**2**	**22.87**	**7.99**	**5.44**
35	**44**	**M**	**2**	**22.6**	**6.96**	**5.69**
36	**31**	**M**	**2**	**22.81**	**7.21**	**5.88**
37	**68**	**M**	**2**	**22.93**	**7.06**	**6.02**
38	**51**	**M**	**2**	**23.26**	**7.09**	**5.24**
39	**41**	**M**	**2**	**22.99**	**6.91**	**5.49**
40	**31**	**M**	**2**	**23.11**	**6.63**	**5.59**
41	**63**	**M**	**2**	**22.65**	**6.99**	**5.79**
42	**58**	**F**	**2**	**22.56**	**6.84**	**5.61**
43	**43**	**M**	**2**	**22.76**	**6.83**	**5.4**
44	**64**	**M**	**2**	**22.74**	**6.9**	**5.64**
45	**18**	**M**	**1**	**23.09**	**6.82**	**5.94**
46	**61**	**F**	**2**	**22.99**	**6.67**	**5.95**
47	**32**	**M**	**2**	**23.29**	**6.89**	**5.87**
48	**33**	**M**	**2**	**22.65**	**7.56**	**5.83**
49	**57**	**M**	**2**	**22.91**	**7.25**	**5.54**
50	**51**	**M**	**2**	**23.5**	**6.96**	**5.95**
51	**46**	**M**	**2**	**23.09**	**7.12**	**5.32**

52	**64**	**M**	**2**	**22.89**	**6.9**	**5.8**
53	**18**	**M**	**2**	**22.65**	**6.83**	**5.74**
54	**37**	**M**	**2**	**22.6**	**6.87**	**5.81**
55	**59**	**M**	**2**	**23**	**6.94**	**5.29**
56	**45**	**M**	**2**	**23.13**	**6.98**	**5.21**
57	**69**	**M**	**2**	**22.93**	**6.87**	**5.68**
58	**54**	**F**	**2**	**22.82**	**7.46**	**5.9**
59	**38**	**M**	**2**	**22.61**	**6.84**	**5.88**
60	**65**	**M**	**2**	**22.89**	**7.26**	**5.94**
61	**56**	**M**	**1**	**22.76**	**7.12**	**5.97**
62	**47**	**F**	**2**	**23.23**	**6.84**	**5.32**
63	**67**	**M**	**2**	**22.9**	**6.85**	**5.91**
64	**39**	**M**	**2**	**22.72**	**6.84**	**5.62**
65	**23**	**M**	**2**	**23.07**	**6.98**	**5.76**
66	**49**	**M**	**2**	**22.87**	**6.95**	**5.35**
67	**66**	**M**	**2**	**23.19**	**6.87**	**5.91**
68	**73**	**F**	**2**	**22.94**	**7.16**	**6.01**
69	**62**	**M**	**2**	**22.65**	**7.08**	**5.17**
70	**22**	**M**	**3**	**22.7**	**6.52**	**5.79**
71	**53**	**M**	**2**	**22.92**	**6.84**	**5.91**
72	**41**	**M**	**2**	**23.05**	**6.98**	**5.7**
73	**36**	**F**	**2**	**22.98**	**6.12**	**5.79**
74	**18**	**M**	**2**	**22.9**	**7.32**	**5.39**
75	**59**	**M**	**2**	**22.64**	**6.82**	**5.49**
76	**46**	**F**	**2**	**23.09**	**6.86**	**5.51**
77	**51**	**M**	**2**	**22.64**	**6.85**	**5.38**
78	**37**	**M**	**1**	**22.97**	**6.89**	**5.81**

79	**76**	**M**	**2**	**22.98**	**6.64**	**5.84**
80	**44**	**M**	**2**	**23.19**	**6.82**	**5.92**
81	**62**	**M**	**2**	**22.89**	**6.99**	**5.76**
82	**33**	**M**	**2**	**22.99**	**7.12**	**5.95**
83	**83**	**M**	**2**	**22.9**	**6.91**	**5.48**
84	**54**	**M**	**2**	**23.21**	**6.84**	**5.75**
85	**17**	**M**	**2**	**23**	**6.98**	**5.32**
86	**69**	**M**	**2**	**22.83**	**7.23**	**5.2**
87	**31**	**M**	**3**	**22.65**	**6.84**	**5.61**
88	**47**	**M**	**2**	**22.91**	**6.89**	**5.73**
89	**32**	**M**	**2**	**22.87**	**6.94**	5.29
90	**51**	**M**	**2**	**23.19**	**7.32**	5.68
91	**33**	**M**	**2**	**22.82**	**6.9**	5.84
92	**44**	**M**	**2**	**22.79**	**6.83**	5.4
93	**46**	F	**1**	**23.19**	**6.85**	5.37
94	**57**	**M**	**2**	**23.01**	**6.56**	6.02
95	**35**	**M**	**2**	**22.78**	**6.94**	6
96	**47**	**M**	**2**	**23.51**	**6.9**	5.56
97	**26**	**M**	**2**	**22.87**	**7.32**	5.63
98	**66**	**M**	**2**	**22.78**	**6.96**	5.71
99	**48**	**M**	**2**	**23.12**	**7.03**	5.52
100	**34**	F	**2**	**23.42**	**7.12**	5.19
101	**36**	**M**	**2**	**22.9**	**6.86**	5.23
102	**18**	**M**	**2**	**22.67**	**6.95**	5.05
103	**47**	**M**	**2**	**22.59**	7.02	5.57
104	**37**	**M**	**2**	**22.95**	**6.96**	5.19
105	**53**	F	**2**	**23.21**	**7.12**	5.42

106	**46**	**M**	**3**	**22.57**	**7.01**	5.26
107	**34**	**M**	**2**	**22.62**	**6.87**	5.18
108	**22**	**M**	**2**	**22.68**	**7.21**	5.5
109	**43**	F	**2**	**22.91**	**7.17**	5.33
110	**39**	**M**	**2**	**22.58**	**6.9**	5.15
111	**55**	**M**	**2**	**23.02**	**7.21**	5.47
112	**17**	**M**	**2**	**23.23**	**6.89**	5.06
113	**38**	F	**2**	**22.7**	**7.21**	5.32
114	**59**	**M**	**2**	**22.86**	**6.9**	5.73
115	**49**	**M**	**2**	**22.68**	**7.27**	5.81
116	**19**	**M**	**2**	**23**	**6.89**	5.93
117	**51**	**M**	**2**	**22.9**	**6.92**	5.43
118	**46**	**M**	**1**	**22.84**	**6.94**	5.64
119	**54**	**M**	**2**	**22.91**	**7.03**	5.62
120	**59**	**M**	**2**	**22.87**	**6.96**	5.97
121	**34**	F	**2**	**22.85**	**7.18**	5.48
122	**51**	**M**	**2**	**22.9**	**6.87**	5.31
123	**43**	**M**	**2**	**22.77**	**6.94**	5.21
124	**78**	**M**	**2**	**22.59**	**6.85**	5.28
125	**24**	**M**	**2**	**22.71**	**6.96**	5.69
126	**76**	**M**	**2**	**22.68**	**6.93**	5.81
127	**51**	**M**	**2**	**22.82**	**6.82**	5.26
128	**68**	F	**2**	**22.99**	**7.32**	5.62
129	**35**	**M**	**2**	**23.43**	**6.88**	5.78
130	**52**	**M**	**3**	**22.61**	**6.87**	5.63
131	**44**	**M**	**2**	**22.79**	**6.99**	5.68
132	**59**	**M**	**2**	**22.98**	**6.83**	5.42

133	**55**	**M**	**2**	**22.63**	**7.02**	5.22
134	**36**	**M**	**2**	**22.78**	**6.98**	5.84
135	**58**	**M**	**2**	**22.88**	**7.3**	5.94
136	**71**	**M**	**1**	**22.65**	**7.21**	5.99
137	**47**	F	**2**	**22.81**	**6.81**	5.76
138	**57**	**M**	**2**	**22.55**	**6.64**	5.23
139	**56**	**M**	**2**	**23.01**	**6.93**	5.74
140	**37**	**M**	**2**	**22.67**	**6.87**	5.32
141	**56**	**M**	**2**	**22.61**	**6.81**	5.97
142	**43**	**M**	**2**	**22.9**	**6.92**	5.29
143	**29**	**M**	**2**	**22.78**	**6.56**	5.66
144	**38**	**F**	**2**	**22.56**	**7.12**	5.33
145	**61**	**M**	**2**	**22.65**	**7**	5.75
146	**54**	**M**	**2**	**22.69**	**6.89**	5.72
147	**46**	**M**	**2**	**22.63**	**6.8**	5.88
148	**51**	F	**2**	**22.99**	**6.65**	5.28
149	**61**	M	**2**	**23.29**	**6.75**	5.37
150	**55**	M	**1**	**22.72**	**6.9**	5.77

KEY TO MASTER CHART

A Serial number

B Inpatient number

C Age

D Sex

E Disease type 1 – D (DIRECT) 2 – ID (INDIRECT) 3-

PANTALOON TYPE

F DURATION 1 = <1YR 2 = 1-2 YR

3=2-3YR 4=>4YR

G IRREDUCIBLE 1 - No 2 - yes

H OBSTRUCTIVE SYMPTOMS 1 - No 2 - Yes

I STRANGULATION FEATURES 1 - No 2 - Yes

J RECURRENCE 1 - No 2 - Yes

K Hypertension 1 - Yes 2 - No

L Diabetes mellitus 1 - No 2 - Yes

M ANY OTHER CHRONIC DISEASE 1 - No 2 - Yes

N SITE OF LESION 1 – RT SIDE 2 – LT SIDE 3- BILATERAL

O BMI 1-<18.5 2- 18.5-25 3->25

P ST LINE

Q SS LINE

R MP LINE